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# EXPERIMENTS IN TEACHING STUDENTS HOW TO STUDY[1]

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## THE NEED

IN the paper I presented to this conference last week I pointed out that when reasonably effective methods are used to control admission to the college, the failure of students subsequently is not commonly due to inadequate intelligence; that, on the contrary, the failures are mainly due to several factors, among which, according to the reports gained from the students themselves, a prominent place is to be assigned to neglect of proper instruction in the art of study. To be more specific, among 324 students on probation at the University of Michigan, 57, *i.e.*, one in six, declared that their failures resulted in part at least from the absence of such instruction in their high-school careers, while 115 declared that the difficulty of adjusting themselves to conditions prevailing at college in general, as contrasted to those prevailing in the high school, was the prime cause of their failure—an explanation which obviously is closely related to the first mentioned, since the change that confronted them was mainly in methods of classroom instruction and in the conditions under which the outside preparation of their classroom work was done.

I regard it as unnecessary to present further evidence on this point; it has been brought out by practically every investigator who has studied college failures, and it is confirmed completely by those who are familiar with the situation in the secondary schools. To be sure, one occasionally encounters reactionary professors and administrators who deny either the necessity or the value of instruction in study in the case of college students or who declare that, even if such instruction is needed or is valuable, it is the business of the elementary and secondary schools, not of the college, to provide it. One of my former colleagues at the Uni-

[1] Address given before the Institute on Higher Education, University of Minnesota, July 16, 1928.

versity of Illinois, for example, assured me that any student who is good enough to get into the university must already know how to use his brains efficiently—otherwise he wouldn't be there. If, he added, there are any exceptions to this rule, they are already too old to learn new tricks, so that any such instruction would be wasted on them.

As for the contention that the art of study is properly the business of the preparatory school, I believe most of us are ready to admit its merit; of course, the art of study ought in theory to be acquired as early in the student's career as possible, and, as I shall hope to show, the chief fundamental principles can be grasped and practiced by junior- and senior-high-school students. Yet we confront a fact, not a theory, and the obstinate fact is that the junior and senior high schools do not now, save in quite exceptional instances, give their charges the needed practice in this art. Consequently, the college must undertake it or else pay the penalty in a lower-than-need-be level of general student efficiency.

I notice that Professor Jones, of the University of Buffalo, proposes to circumvent this situation by instituting special precollegiate classes with extra tuition; that is, he would have the prospectively poorer freshmen assemble at the university three weeks before it opens in the fall, there to be rushed through an intensive preliminary training in study. The details of Professor Jones's plan I shall come to a little later. As to the logic of his contention that this training is not the business of the college, and that hence it must be given, though by college instructors, in a special course before the college opens, I have my doubts. In any event, that problem is primarily an administrative one. Personally, it seems to me more important to decide that such training shall be given to the freshmen and to discuss what the training should consist of than to debate whether it should be given before or after the first semester opens.

Two other questions might be raised here at the outset: namely, the question whether the students themselves really desire this training and the question whether all of them or only the less well-endowed ones need it.

Twelve years ago I would have answered the first question negatively. But about that time I had an illuminating experience. I was asked to talk to a group of a dozen high-school students on how to study. When I was finally convinced that they really wanted this talk, I consented to undertake it. I was surprised and delighted at their reception of my

efforts; they listened attentively, discussed the matter intelligently, asked a number of salient and even difficult questions, and furthermore took the trouble several months later to visit me, in order to report how much their school marks had improved as a result of putting into practice some of the suggestions we developed. That was my first experiment in training pupils how to study. It cured me of my notion that students were indifferent to the problem, that they would adopt a more or less bored and cynical attitude toward what I feared sounded too much like preaching.

About four years later, after I had taken occasion to expand the material of my little talk and to publish it in book form, an opportunity appeared for a second and more serious experiment. An enterprising young woman who was principal of a small high school not far from the University of Michigan suggested that she make an attempt to measure the effect of the use of my book by dividing her freshman class into a training and a control section and comparing the school records of these two groups after one semester had elapsed. The experiment succeeded beyond my expectations. This is not the place to mention the quantitative results attained, but rather to mention an episode that, for scientific purposes, nearly wrecked the whole undertaking. The principal discovered about a month after the experiment had started that several students in the control section had become indignant because they were getting none of the special instruction that was being given to the training group: a number of them got their heads together, discovered from one of their mates what book was being used in the training group, sent off an order for it to the publishers and were reading it on the sly! The worried principal explained the nature of the experiment she was trying to carry out, and finally appealed to them: "Please don't try to know anything about how to study; if you will promise me you won't, I will promise you that I'll give you double time on studying next semester!" Answer enough, I think you will agree, to the question: Do students really desire training in how to study?

As to the second question just raised—whether the better-endowed students can profit from this training—the answer is perhaps less obvious. Practically all the effort of special training classes thus far operated for college students has been specifically directed toward the incompetent student. Thus, Jones's special drill course, to be described in a moment, dealt only with 32 students specially selected as likely to fail, and Jones expresses the opinion that for those who rank in the

upper thirty-five or forty percent of their high-school classes, "studying has become a better practiced technique, and would not be so easily improved." Book, whose experiment at Indiana I shall also describe, is willing apparently to go a bit farther than this, for he says instruction in studying ought to be given not simply to all college students who have failed, but to all students who really want to improve their methods of work. However, I know of no extensive experiment to determine whether competent freshmen will or will not profit by systematic training in studying. It is my personal impression that, while less improvement will be exhibited by such students, still it would be a short-sighted policy to withhold it from them on the ground that they are doing well enough already, for, as a matter of fact, we know that many well-endowed students are not by any means doing as well as they might in their classroom work. Those of you who are familiar with experimental psychology know that the results of special practice experiments have shown clearly that subjects competent at the start usually gain more from the practice than those less competent at the start. Consequently, if a course in how to study contains suggestions for any details of technique that the competent students have not previously used, our expectation would be that these students would be the ones who would profit most by the suggestions. If you object that no course of instruction given to college freshmen is likely to contain suggestions for effective studying that are not already known to bright students, my reply is that I know from my own experience that better ways of doing something that one has already been doing reasonably well are likely to occur even to a mature college professor or that the chance remark of a colleague or some glimpse of the method used by some other person may afford a decidedly useful suggestion for economizing time. It was not until my junior year in college, for example, that a playful remark made by one of my roommates, who yelled "Biggity, biggity" when one of us chanced to use a lengthy and novel technical term, set us off in a contest to see who could acquire and use the most new words in the next thirty days. This experience I recently turned to account in devising an exercise on the enlargement of vocabulary which I am now seeking to make available to high-school students. Again, I saw in the study of a California professor two years ago a device for organizing work that I have since adopted myself to much advantage. No, I must refuse to admit that an intelligent student cannot be told anything to his advantage about studying, and my recommendation is definitely that courses in the art of study, whether in

the public schools or in the college, should be given to *all* students. I venture to predict that the plan now contemplated here at Minnesota for giving special instruction in these matters to the poorer students will be found worthy of extension in the near future to all entrants.

My third experiment in training students to study was likewise carried on in a Michigan high school—this time at the Practice High School of the Ypsilanti State Normal College, where the then principal, Mr. J. B. Fuller, oversaw the work. This experiment had a new object. Experience had convinced me that practically every important rule for effective studying can be understood, without much instruction or help from the teacher, by the great majority of senior-high-school pupils and by at least the better ones of the junior-high-school pupils. To bring these rules to the attention of high-school or college students and have them *understand* them is, accordingly, not difficult. But to have them *apply* the rules to the actual processes of studying a given subject is quite a different thing. Furthermore, to apply a rule correctly to the actual studying of a subject under the direction and guidance of the instructor is one thing, and to use the same rule daily, without being directed to do so, is quite another thing. In other words, it is comparatively easy to acquaint pupils with the *rules* for effective studying; it is comparatively difficult to develop *habits* of effective studying.

I confess that I had entertained originally the fond delusion that teachers and instructors would at once perceive this and would take steps accordingly to afford practice in the rules they taught their students. Later, and only relatively recently, I perceived my error. I concluded that any set of rules for studying needed to be supplemented by a set of exercises that would make the rules more real, would enable the students to practice them, would start them on the road to the formation of correct habits of mental work. The Ypsilanti experiment, then, concerned the actual development and perfecting of a series of such study exercises. It is not my intention here to go into the details and results of this experiment, but merely to make clear its object. Suffice to say that out of the dozen or so exercises that were devised and tested, all but one turned out successfully. The experiment demonstrated the value of a set of drill exercises to be used concomitantly with a set of rules. There was no doubt that these exercises increased the interest of the students in the work and assisted the teachers in keeping concrete illustrations of the technique of study before the students. I was so

encouraged by this outcome that I have since then enlarged the scope of this undertaking until at present some 35 exercises are available. I may say that at present I have no experimental evidence of the usefulness of about two-thirds of these exercises. It is hoped that the trial of some 16 of them now contemplated here at Minnesota will reveal whatever merits or demerits they may possess for use with college freshmen. Whether the particular exercises I happen to have devised are psychologically and pedagogically efficient or not, I do not know; but I do feel certain that the general principle involved is both sound and important—namely that the instruction of students in the rules for effective studying must be supplemented by some device for guaranteeing their practice.

### SOME RECENT COLLEGE EXPERIMENTS IN TEACHING THE ART OF STUDY

I propose next, with your permission, to describe two recent experiments on training college students to study and then to consider briefly the content of such a course of training as seems to me to be desirable.

#### 1. Jones's Experiment at Buffalo

Professor E. S. Jones has recently reported[2] the results of experiments conducted in 1926 at the University of Buffalo. According to him, only about one in six of the lowest fifth and one in four of the next lowest fifth of high-school seniors can maintain an average, or 'C', grade in the freshmen year at that university. His experiment consisted in an attempt to answer this question: Would it be possible by a special precollegiate period of intensive training, a period of two and a half weeks, to bring these 'poor risks' up in the scale of collegiate achievement to the point where they could compete with the average students, those in the middle fifth? His answer is: Yes.

His poor risks numbered thirty-two. Their two and a half weeks of training comprised mainly these six things:

(1) A stiff regimen of composition writing, with individual conferences,
(2) Drill in rapid reading, with tests of comprehension,
(3) Drill in mathematical problems,
(4) Lectures on note-taking, mental hygiene, habits, attentiveness, memorizing, etc.

[2] Jones, E. S. "Testing and Training the Inferior or Doubtful Freshmen." *Personnel Journal.* VI (1927), 182-191.

(5) Drill in note-taking, and

(6) Assigned readings.

There was added certain miscellaneous work, as, for instance, periods in which each student was called upon to criticize or defend statements.

The net outcome of this experiment is declared to have been distinctly favorable, especially in raising the college performance of the lowest fifth of the high-school seniors.

The six types of training just mentioned were felt not to have been of equal value, and some of them were felt to be open to improvement when tried again. In the estimated order of merit, the several methods rank thus:

1. Most effective of all seems to have been the drill in composition. Jones says that in previous years one half of these poor risks would have failed in English, whereas not a single one of his 32 failed. To accomplish this result, an hour and a half was spent each morning. The instructor lectured on important points in composition writing and illustrated his points by reading themes. Themes were assigned the men to write and each was criticized constructively after being read aloud. Two weeks were spent in daily work of this sort.

2. Next most useful was the drill in rapid silent reading. Simple material, mostly taken from newspapers, was employed. The speed and comprehension of each student were measured by tests and their scores posted publicly to incite competition. At the end of the two weeks the speed attained was said to average about 360 words a minute for the material used.

3. Drill in note-taking seemed decidedly needed. Some of the prospective entrants had never taken a single note in their entire school days and none of them had any notion as to how to go about this systematically. Two lectures were given, the students read Kitson on note-taking, and arrangements were made to have instructors look over the students' notes and quiz them about them. This effort, however, was less successful than had been hoped, partly because individual inspection and conferences on the note-books were so time-consuming. More is to be tried in this direction another year.

4. Drill in algebra, mostly of a simple sort, was somewhat effective, but not enough to forestall failure in freshmen mathematics.

5. The series of ten 50-minute lectures on various topics was thought by the instructors to have been valuable, but they are not certain of this and found no way of measuring the effect of the series.

### 2. Book's Experiments at Indiana

Professor W. F. Book, author of a text entitled *Learning How to Study and Work Effectively*, has recently reported the results of investigations made under his direction upon the reading abilities and the study habits of students at the University of Indiana.[3] Book's first report calls attention to the fact that probably ninety percent of the information acquired by college students is obtained by reading and to the further fact that the majority of freshmen known to be doing poorly in college are also found to be defective in reading ability. For example, when a typical reading assignment was given these freshmen, with the understanding that they were to be prepared to answer the questions upon it a day or so later, only 27 percent of the men and 39 percent of the women could state the title of the chapter they had read or formulate clearly the problem discussed in the chapter. Similarly, while the best student could recall 94 percent of the main points in the chapter, the poorest could recall only 3 percent of them, and the average freshman only about 30 percent of them. Thus, the best student was 17.1 times as efficient as the poorest. Again, the scores of these students in my own *High School and College Reading Test* ranged from 1 to 19 of a possible 20, so that the best student (if we assume the scores represent approximately equal units) is here found to be 19 times as good as the poorest student. The effect of eight weeks of special instruction in rapid reading is estimated to have been an improvement of 102 percent in ability to read and an improvement of from 60 to 97 percent in ability to prepare a standardized assignment. In a subsidiary experiment an advanced class in educational psychology was divided into two groups, one of which was given only 6 hours of special instruction in ways of reading and methods of conserving time and developing interest. The coached section then obtained an average efficiency of 69.5 percent in a reading test in which the uncoached section averaged an efficiency of only 59.2 percent—a really striking difference when one considers the very brief character of the special coaching.

Book's second report deals more fully with the methods he employed in giving how-to-study instruction to Indiana University freshmen. The situation there seems typical of many American colleges; 16 percent of the freshmen were found to have failed in as many as half of the courses

[3] Book, W. F. "How Well College Students Can Read." *School and Society*, XXVI (1927), 242-248, and "Results Obtained in a Special 'How to Study' Course Given to College Students." *Ibid.*, 529-534.

in which they were registered. Book estimates that the percentage of freshmen sent home from American institutions of higher learning will be found to lie usually between 20 and 33 percent.

As to the chief directions in which efforts are to be turned to meet this rather damning situation, Book mentions especially three:

First, the training of freshmen in reading. Here, as I have already said, he claims to be able to produce in a few weeks an increase of 102 percent in speed of silent reading and an increase of 37 percent in efficiency of preparing standard assignments.

Second, the training of the freshmen in methods of conserving their time. Methods were devised for measuring their efficiency in this respect and suggestions were given for increasing it. Book estimates that without special training the average student uses about 76 to 84 percent of his available time efficiently, whereas after instruction the efficiency rises to perhaps 84 to 98 percent.

Third, the training of the freshmen in planning and in carrying out their plans. This feature seems to be somewhat closely allied to the one just mentioned. The point stressed by Book is that the untutored student goes at all his work in a haphazard way and is more or less at the mercy of chance stimuli. The instruction given was designed to emphasize the great importance of laying out a plan for undertaking any task and of adhering to this plan.

The net outcome of all this training was measured in terms of number of credit-points earned per semester; the increase in these points after the training was, for one group, from a previous 16.04 to 22.50 and in another group from a previous 18.02 to 24.58—in both cases, therefore, an increase of approximately 50 percent in academic credits attributable to the how-to-study training. Other compilations show that 87 percent of the freshmen in these coaching courses did satisfactory work in *all* their freshman courses, which, in the light of what we know about freshman failures, can scarcely be interpreted as anything short of a surprising achievement.

## DETAILS OF TRAINING IN STUDYING

The accounts of the two college experiments just put before you demonstrate conclusively that college freshmen need training in reading, in conserving their time, and in planning their college work. I should like, however, for a few minutes to go somewhat beyond these broad general

statements and to consider in a more detailed way just what may wisely be included in undertaking this needed training for effective study. With respect to these details I am obliged to forsake the realm of experimental investigation: what follows represents mostly my personal opinio

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important. It is here, I believe, that the poorer students stand especially in need of help. Stress should be laid on getting started promptly, on the development of proper attitudes of persistence, of intent to learn, of the avoidance of worry and excitement, and especially of the method of avoiding distractions both from without and from within.

D. The general rules of procedure in studying must constitute the bulk of the training course; they are too numerous to explain here, but would include such obvious precepts as: understand the aim; make

quick reviews of preceding units; learn rules and definitions thoroughly before trying to use them; suit your pace and style of reading to the material in hand; seek to enlarge your vocabulary daily; learn to make efficient use of the aids to study supplied in your college library (card

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tions, the avoidance of undue padding, the need of rereading papers before submitting them, and other such matters that are often not learned by the college student until after painful experience has taught him their wisdom.

These suggestions will serve to show in a sketchy way the details that in my judgment, might well be included in teaching college students how to study effectively. Let me close by saying once more that such in-

statements and to consider in a more detailed way just what may wisely be included in undertaking this needed training for effective study. With respect to these details I am obliged to forsake the realm of experimental investigation: what follows represents mostly my personal opinion concerning desirable features in a campaign for better studying. These features may be grouped around eight main rubrics, eight things that students need to know:

A. Knowing what physical and mechanical conditions are favorable to studying;

B. Knowing where, when, and how long to study;

C. Knowing how to concentrate attention;

D. Knowing the general rules of procedure in studying;

E. Knowing how to think over and apply what has been learned;

F. Knowing how to learn in the classroom;

G. Knowing what to commit to memory and how to do it economically;

H. Knowing how to prepare for, and how to take, examinations.

I should like to illustrate these eight rubrics briefly, just enough to make clear what I have in mind.

A. Instruction in the general physical and mechanical conditions favorable to study should stress the need of keeping in good physical condition, of removing handicaps like impaired vision, defective teeth, etc., of paying proper attention to such matters as light, ventilation, temperature, size and position of study desk and chair, and of providing such tools of study as pencils, erasers, blotters, dictionaries, drawing sets, and the like, in proper numbers and of proper qualities. These are all elementary matters, but too frequently neglected.

B. Instruction in the where, when, and how long to study. This would, of course, include particularly the matter of budgeting time, the best duration of study, the wise use of repetition, etc.

C. Instruction in the art of concentration I regard as particularly important. It is here, I believe, that the poorer students stand especially in need of help. Stress should be laid on getting started promptly, on the development of proper attitudes of persistence, of intent to learn, of the avoidance of worry and excitement, and especially of the method of avoiding distractions both from without and from within.

D. The general rules of procedure in studying must constitute the bulk of the training course; they are too numerous to explain here, but would include such obvious precepts as: understand the aim; make

quick reviews of preceding units; learn rules and definitions thoroughly before trying to use them; suit your pace and style of reading to the material in hand; seek to enlarge your vocabulary daily; learn to make efficient use of the aids to study supplied in your college library (card catalogs, readers' guides, glossaries, encyclopedias, source books, etc.); locate your weak points and give special time and attention to them, and so on.

E. A special set of rules should be developed and taught in order to train the student to work over and apply what he learns, to get away from the sheer memoriter type of studying and to convert his information so far as possible into material to be put into his personal use. Here I would put such suggestions as: work out your own illustration of principles; maintain a questioning attitude; try to anticipate conclusions presented by lecturer or author; make outlines of your reading; consider both sides of all controversial issues.

F. The discussion of learning in the classroom should include instruction in the taking of notes (shown to be important by various investigators) and stress on following the contributions of fellow students persistently and critically.

G. Instruction in committing to memory should aim to show what sort of matters should be memorized and what should not, and what are the most common rules for committing to memory economically *e.g.*, read aloud, read rapidly, learn as a whole, etc.

H. Finally, I am certain that all beginning college students can profitably be given some training in the taking of examinations, both because too frequently they have had little or no experience in this in the high school, and also because in many colleges the final course mark is heavily loaded by achievement in the final examination. This training should include instruction as to the time to begin reviewing, the best methods of doing the reviewing, the attitude to be assumed when confronted by the examination, the proper way to organize replies to questions, the avoidance of undue padding, the need of rereading papers before submitting them, and other such matters that are often not learned by the college student until after painful experience has taught him their wisdom.

These suggestions will serve to show in a sketchy way the details that in my judgment, might well be included in teaching college students how to study effectively. Let me close by saying once more that such in-

struction is needed, that it is welcomed by the students, that it ought to be done in the secondary schools but is not, that, consequently, the college must assume the responsibility. I am convinced, and I believe the experimental evidence confirms my conviction, that this training will produce really surprising results.

# A SURVEY OF ENGLISH GRAMMAR IN THE HIGH SCHOOLS OF IOWA, 1926-1927

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THE survey reported here was made possible through the coöperation of the Iowa Association of Teachers of English and the University of Iowa. It was proposed to conduct a comparative study of the status of instruction in English grammar. The survey had been conducted for the first time in 1925-26, but a new test was prepared for 1926-27. This test will be described later. All the high schools in Iowa were asked to coöperate in giving the two equivalent tests which had been prepared. Fifty schools agreed to purchase the materials at cost, give the tests, and submit the reports to the University of Iowa. This was done in February, and in May the same schools were asked to give the second form of the same test, designated Test II. Forty schools submitted results on Test II. For this reason all the figures quoted in this paper will be based entirely on the forty schools which took part in the testing programs of both February and May. The tests were given in high-school grades from nine to twelve inclusive. About 7,000 students were involved in each testing period.

There are many hundreds of numerical comparisons with can be made from the data. These would show the points of weakness and strength of the various schools as well as the grades in each school, and even of the individual pupils. Obviously such a detailed analysis of results is not desirable at this time, although all such information was available to each superintendent and instructor shortly after the tests had been scored. It will suffice for present purposes to cite from several detailed tables which give a composite picture of the quantitative results from the testing program.[1]

Let us consider, first of all, the February testing and ask the question, Was there much variation in the average grade achievement among the Iowa high schools? The answer is distinctly and incontrovertibly, yes. A perfect score on the test is 190. The lowest 9th grade average was 47 and the highest was 107; the lowest 10th grade average was 48 and the highest, 138; the lowest 11th grade average was 66 and the

[1] These tables are too long for inclusion in this paper.

highest, 161; the lowest 12th grade average was 59 and the highest, 151. The standard deviation was 35. It is to be borne in mind that all these averages are based on every student in the particular grade of the school under consideration. The schools here compared are so different with respect to the achievement of their pupils in this test that they can scarcely be considered in the same statistical distribution.

The results for the May testing are not much different. The lowest 9th grade obtained an average of 46, the highest 143; the lowest 10th grade 54, the highest 177; the lowest 11th grade 61, the highest 177, the lowest 12th grade 62, the highest 165. The standard deviation was 36. The test given in May was closely equivalent to the one given in February, so that all scores are directly comparable. Hence it appears that the grades with the poorest performance do not better their condition between February and May, but that the best schools accomplish a significant amount during the same period.

A second comparison can be made to bring out the direct gain for each grade from February to May, a period of three months' instruction. In the 9th grade the gain was 4 points; in the 10th grade 6 points, in the 11th grade 6 points; in the 12th grade 6 points. Thus the average gain from year to year as measured by this test, although small, is surprisingly consistent. This consistency cannot be due to the structure of the test itself, inasmuch as all these averages are far below the effective measuring range of the test. It will be recalled that a perfect score is 190 and that one school reported an *average* of 177 for all its 10th and 11th grade pupils. As far as the test is concerned there is no reason why this annual increment of 6 could not have been 10 or 20 or even 30.

These gains were scattered in small amounts over the four parts of the test. The chief gain was in spelling. There the average in May was 31 where it had been 28 in February. Since there were 50 words to be spelled it is clear that this improvement is indeed slight.

The figures which have been quoted have little significance unless they stand for some real differences in essential knowledge of English grammar. It will be necessary, therefore, to give a brief description of the test itself in order to explain just what it was that the high-school students were asked to do.

Part I is referred to on the test-blank as a dictation exercise. It is, however, purely a spelling test. Fifty words are imbedded in sentences which the teacher dictates to the pupils. This part of the test is reproduced in Table I.

TABLE I

THE DICTATION FOR TEST I

(1) The *bulletin* told *of violence* / of the *enemy*.
(2) It was a *mystery* / that he *buried* / the *exquisite specimen*.
(3) *Receipt of congratulations* / will not *disappoint* him.
(4) Her *conception of statistics* / is *acceptable*.
(5) *Originally*, / the *approximate basis* / was *scientific*.
(6) This is an *edition* / of *technical pamphlets* / on one *phase* of *geometry*.
(7) One can *ascertain approximately* / *specific opportunities*.
(8) He *recommended* / an *equipped dormitory* / and a *magnificent auditorium*.
(9) *Occasionally* / an *enthusiastic communication* / is *delinquent*.
(10) The *privilege* / *accompanying* the *guarantee* / was *duly seized*.
(11) The *physician* / has an *adequate schedule* / of *procedure*.
(12) It is *ridiculous* / to *reckon* time / so *indefinitely*.
(13) It is *extraordinary* / that *incidentally* / I *perceive* a sound.

The sentences are first read clearly and distinctly and then repeated in short sections at a slow rate. The significant words are italicized. The pupils write complete sentences. This method of conducting a spelling test had already proved successful, particularly in the Stanford Achievement Test. The really important consideration is the selection of the words themselves. These words were drawn from a recent monograph by Ernest Horn entitled *A Basic Writing Vocabulary, the 10,000 Words Most Commonly Used in Writing*. This study represents by far the most thorough and extensive investigation of writing vocabulary. It is based on over 5,000,000 running words drawn from 65 types of written material. There is no question about the validity of these 10,000 words. The words in the English Essentials test were drawn only from the first 5,000 of Horn's list. In order to eliminate very common monosyllables and also words which might be considered peculiarly difficult the sample was restricted to those words which pupils in 8th grade spelled with an accuracy of from 20 percent to 80 percent. Thorndike had already estimated the average vocabulary of high-school students as ranging from 10,000 to 11,500 words. Hence the sample of 50 words used in each form of the English test does not consist of special spelling demons, nor unusual terms brought in for the purpose of bewildering pupils. From the standpoint of spelling, Horn's list is superior to previous tabulations because it is based on a *writing* vocabulary. Teachers are fairly well agreed that pupils should at least learn to spell all the words which are commonly used in everyday writing.

One could easily gather from the thousands of scored tests a few with perfect and several hundred with nearly perfect scores in the spelling test. In May, the upper quartile for the spelling test was 42. This indicates that one pupil out of four got at least 42 of the 50 words right. From these observations one might reach the conclusion that the spell-

ing test is not only reasonable, but even too easy. On the other hand, one could just as readily draw out several hundred papers in which the number of correct spellings was not more than two or three out of 50. From these one could argue with some cogency that the spelling test is altogether too hard. The writer has had one of these very poor papers mimeographed in order to show what is meant by bad spelling. It is reproduced in Table II. The pupil responsible for this comedy of errors is 14 years old, in the 9th grade, and in the same school system and same grade as another fourteen-year-old who spelled correctly every one of the 50 words. This boy attempted 47 out of the 50 words and made 47 mistakes. It may very well be that he is a pathological case requiring much more than the ordinary school teacher can hope to provide, but he is regularly enrolled in a school class and has not been considered a special problem.

TABLE II

SPELLING OF A 14-YEAR OLD BOY IN GRADE 9A OF A SAMPLE OF 50 WORDS DRAWN FROM HORN'S LIST OF THE 5,000 COMMONEST WORDS

(Iowa Tests On English Essentials, 1926-1927, Test I, Part I)

1. The *buletin avilance* of the *emeny*
2. It was a *mistrey* that he *burried exquisence speciman*
3. *Recpit* of *congralation* will not *disspoint* him
4. Her *comcepation* of *sustieticks* .....
5. *Orignally* the *appraxment bases* was *signad pireftry*
6. This is an *addition* of *teckincan pamthsof* on one *faze* of *jemiter*
7. One can *asstertained aproxamently* ..... *opper* .....
8. He *recomened* an *equiped* ..... and a *magnicifint audditorem*
9. *Occanely* an *enthusactic conmuncation* is *dilinquint*
10. The *privalge accompany* the *garntie* was *newly sized* (duly seized)
11. The *position* (physician) has an *adquit schegil* of *proc* .....
12. It is *redutican* to *reck* time *indifadly*
13. It *extreordaniary* that *incendently* I *proceed* (perceive) a pas

| | |
|---|---|
| Number of words attempted | 47 |
| Number of words misspelled | 47 |
| Highest score for Grade 9A (actually attained) | 50 |
| Score on this paper | 0 |
| Mean (average) score for Grades 9A and 9B combined | 23 |

It is possible to give a tentative answer to the question of the difficulty of the spelling test. It appears to be of about the right difficulty for the 9th grade from the viewpoint of testing technique, since the average score of 23 in that grade permits about as much deviation above as below it. It is perhaps too easy for the upper high-school grades, since the 12th grade average was 33.

Part II, comprising 50 items, is a measure of punctuation. The excerpt below, consisting of the directions and the first five items, illustrates the type of test employed. A correction for guessing is made in Parts II, III, and IV.

Directions: Some of the examples given below are punctuated correctly, and some are not punctuated correctly. If the example is punctuated correctly, place an

R after it; if it is not punctuated correctly, place a W after it. If any example is too hard for you, skip it, and go on to the next one. *Don't try to guess!*

Note that the first two examples are already properly marked. The first one is right, so it is marked R; the second is wrong, so it is marked W.

| | R |
|---|---|
| (a) Mr. Jones was reading. | ..... |
| | W |
| (b) May I start. | ..... |
| 1. Marion Talley, who is only nineteen years old, will probably become a great singer. | ..... |
| 2. Armistice Day, November 11, ought to be a holiday. | ..... |
| 3. Gertrude Ederle, who was the first woman to swim the English Channel, has appeared in many American cities recently. | ..... |
| 4. He said, "Give as much money as you can." | ..... |
| 5. The colors in our flag are red white and blue. | ..... |

Part III consists of 40 items covering the commonest grammar "demons." The directions and first 5 items reproduced below indicate the content and the examination type.

Directions: In each of the sentences below mark out the wrong form within the parentheses. What is left will be a correct sentence.

For example, a short line — should be run through "he" in sentence (a) below.

(a) I told (he, him) to come.

1. This is a (real, very) interesting book.
2. I ran down the hall and (come, came) into the room.
3. The people (which, who) do this kind of work are well paid.
4. There she (sat, set), waiting for the train to come.
5. I did not know that he had (went, gone) to Florida.

Part IV consists of 50 sentences which illustrate a variety of common language errors, particularly those which are related to sentence structure. The directions for this part and the first 5 items are given below.

Directions: Some of the examples given below are correct, and some incorrect. Examine each sentence. If the sentence is correct, place an R after it; if the sentence is incorrect (in any way), place a W after it. If any example is too hard for you, skip it, and go on to the next one. *Don't try to guess!*

Note that the first two examples are already properly marked. The first one is right, so it is marked R; the second is wrong, so it is marked W.

| | R |
|---|---|
| (a) I am ready to begin. | ..... |
| | W |
| (b) He ain't here yet. | ..... |
| 1. Having finished my work for the day, I hurried home. | ..... |
| 2. Every pupil had ought to study history. | ..... |
| 3. He often talked as if he had become discouraged with life. | ..... |
| 4. Although there was a sufficient amount of rainfall and, consequently, a large yield for all grain crops. | ..... |
| 5. As they touched the water we began firing and got five ducks out of that flock and we felt happy indeed. | ..... |

The foregoing illustrations give only a pictorial concept of the material in Parts II, III and IV of the English test. A few compact statements will be made therefore concerning the validation of this portion of the test. The items were drawn from the following sources:

(1) Theme error counts of M. F. Carpenter of the University of Iowa High School and members of the Executive Committee of the Iowa Association of English Teachers.

(2) A study of the common punctuation situations by T. J. Kirby.

(3) Handbooks of language usage for high-school and college students.

(4) Items previously validated in the 1925-26 survey of Iowa high schools.

(5) Items previously validated for the Iowa Placement Examinations (by Carpenter and Stoddard).

(6) Agreement of 10 judges (7 high-school and 3 college teachers) on (a) the major parts of the test; (b) the sub-divisions of primary importance; and (c) the specific items representing each point of grammar.

(7) A preliminary experiment in which 200 high-school students took both tentative forms of the test (together with additional items validated as indicated above, with a time allowance which permitted 80 percent to finish. The difficulty of every item was then computed, and items which proved too hard or too easy were eliminated. The two forms were then exactly equalized, the items were placed in ascending order of difficulty, and a generous time-limit for each part was established.

Obviously this procedure does not guarantee the validity of every item, and the material is not extensive enough to comprise a satisfactory diagnostic test; but it is believed that each part of the test possesses adequate validity for survey purposes. The steady rise of mean score from grade to grade for the 40 schools, together with the extreme range from the worst to the best schools, gives evidence as to the flexibility of the test.[2]

Reliability data for the test are given in Table III.

TABLE III

RELIABILITY OF IOWA TEST ON ENGLISH ESSENTIALS

| GRADE | R | N | S.D. | $PE_{score}$ |
|---|---|---|---|---|
| IX | .92 | 100 | 30 | 5.6 |
| X | .91 | 100 | 31 | 6.2 |
| XI | .92 | 100 | 32 | 6.0 |
| XII | .87 | 100 | 29 | 7.0 |
| IX-XII | .93 | 200 | 33 | 5.7 |

[2] The Iowa Tests on English Essentials are a non-commercial venture, not copyrighted, and obtainable at cost on application to the writer.

The principal findings are given quantitatively in Tables IV and V. They may be summarized as follows:

(1) The test proved difficult for Iowa high-school pupils, but one or two schools reported very high averages for each grade.

(2) The variation in the performance of individual pupils was extremely high. The May testing of students about to graduate from high school showed a range in score from 3, or practically zero ability, to 190 or perfect score. The mean or average score also showed radical differences among the schools.

(3) There was, on the whole, a fair gain in achievement from Grade IX to Grade XII.

(4) Apparently there was little growth in knowledge of spelling and grammar during the final semester of the senior year, even though the February results for individual pupils were known to the teacher.

(5) The test itself showed a sufficient range to permit large gains. Its upper limits were reached by only one or two schools.

TABLE IV

IOWA TESTS ON ENGLISH ESSENTIALS, 1926-1927—TEST I (FEBRUARY)
(The 40 schools reporting both Test I and Test II)

(1) All Schools (N = 40); All Grades (6,977 pupils)

| | Part 1 | Part 2 | Part 3 | Part 4 | Total Score |
|---|---|---|---|---|---|
| Mean | 28 | 23 | 20 | 15 | 85 |
| Median | 29 | 23 | 20 | 14 | 83 |
| S.D. | 13 | 10 | 10 | 10 | 35 |
| Lower Quartile | 18 | 15 | 12 | 8 | 58 |
| Upper Quartile | 39 | 30 | 29 | 21 | 110 |
| Perfect Score | 50 | 50 | 40 | 50 | 190 |

(2) All Schools (N = 40); by Grades; Total Scores

| | Grade IX | Grade X | Grade XI | Grade XII |
|---|---|---|---|---|
| Mean | 70 | 79 | 94 | 104 |
| Number | 1761 | 2293 | 1827 | 1096 |

TABLE V

IOWA TESTS ON ENGLISH ESSENTIALS, 1926-1927—TEST II (MAY)
(The 40 schools reporting both Test I and Test II)

(1) All Schools (N = 40); All Grades (6,604 pupils)

| | Part 1 | Part 2 | Part 3 | Part 4 | Total Score |
|---|---|---|---|---|---|
| Mean | 31 | 23 | 21 | 17 | 90 |
| Median | 32 | 23 | 21 | 16 | 90 |
| S.D. | 13 | 11 | 10 | 10 | 36 |
| Lower Quartile | 21 | 14 | 13 | 9 | 63 |
| Upper Quartile | 42 | 31 | 29 | 24 | 117 |
| Perfect Score | 50 | 50 | 40 | 50 | 190 |

(2) All Schools (N = 40); by Grades; Total Scores

| | Grade IX | Grade X | Grade XI | Grade XII |
|---|---|---|---|---|
| Mean | 74 | 85 | 100 | 110 |
| Number | 1703 | 2102 | 1766 | 1033 |

In consideration of these findings a number of questions arise which appear of some importance in teaching practice. It is true that Eng-

lish is by no means all of the high-school curriculum, and certainly the grammatical or so-called mechanical aspects of English do not comprise all the subject matter; but they do monopolize a good portion of teacher time and pupil time and school funds from first grade to twelfth. The problems which arise from this source are ever present in the English classroom, whether recognized or not in the later years of the high-school period. And they exist also in almost every other subject in the curriculum. They are not neglected by the most flowery statements about the aims of education for they are either explicitly mentioned or taken for granted as a preliminary training which every educated person should have.

First of all, how much is it worth to the individual pupil, and to society at large, to pound into the heads of unwilling students a great mass of prosaic information about the rubrics of English grammar? The pupil who in 9th grade missed 47 words out of 47 attempts showed a "sales resistance" to the technology of teaching which is worth studying, and, as was noted before, he does not stand alone in the schools of Iowa. He is, nevertheless, something of an individualist, inasmuch as his associates have not usually seen fit to adopt his particular misspellings. It is safe to state that most teachers underestimate this resistance to mental impregnation which can be put up by many pupils while maintaining an attitude of respectful attention.

Second, surveys of this type, and much more extensive ones, should be conducted at regular intervals. It is easy to forget how bad conditions are; and the work of teachers, when compared only with that of others in the same system, cannot be properly evaluated.

Third, there should be some working agreement concerning the amount of variability which students should be expected to show at the end of twelve years of schooling. Teachers do not want them all poured in the same mould, but neither do they wish to see individuality expressed in arithmetical computations, spelling, or knowledge of the elements of English grammar. Individuality should flower at a much higher level than this and to the extent that these subjects are really mastered and made habitual will the higher centers be freer to work on more important concepts.

Fourth, in high schools which do not claim to teach these mechanical features but devote most of their time to teaching literary appreciation, it is clear that theirs is the burden of proof. Thus far there is no evidence whatsoever that some high schools made a poor showing in spelling

and grammar *because* their students were brought to a high degree of excellence in literary style and literary appreciation.

Certainly some schools in Iowa are much more effective than others in teaching the essentials of English grammar—and what is true of a whole state is likely to be true of many states of similar educational environment. But the factors which cause these differences have not been brought to light. In view of the tremendous cost down through the grades of instruction in this field, is not the time ripe for a concerted attack upon the problem of methods and materials of high-school instruction in English essentials? Can we come to an agreement on such straightforward questions as these: Should spelling be taught in the high school? Is there time enough for specific teaching of 10,000 spellings prior to the high-school period? Will proficiency in spelling be attained incidentally by the high-school pupil through proper habits acquired earlier?

Snedden[3] in 1917, discussing the question of formal English, painted a gloomy actuality but a cheerful prospect:

"In a high school it should be possible to acquaint each pupil, by more or less mechanical devices, with his characteristic defects in spelling, penmanship, and grammatical expression, to enable him by special studies and in a very short time, to attain correct form in these fields, much as in our gymnasiums we now employ individual exercises and training for corrective and departmental work. Our present practice (or lack of it) in these fields now impresses the educational administrator as being clumsy, lacking in purposiveness, and almost barren of results. The great need, as I see it, is greater definiteness and standardization of specific aims, as preliminary to the scientific study of the best ways of realizing them."

In the past ten years what aims in the teaching of English essentials have been realized?

[3] Snedden, David. *Problems of Secondary Education.* (Boston: Houghton Mifflin Company, 1917), pp. 178-179.

# THE LATER PERFORMANCE OF UNDER-AGED CHILDREN ADMITTED TO SCHOOL ON THE BASIS OF MENTAL AGE

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SUPERINTENDENTS of schools and school committees are often faced with the problem presented by the child who is a few days or weeks too young chronologically to enter school under the existing regulations, but whose parents are very anxious, sometimes for very good reasons, that he shall not delay for another year the beginning of his formal education. In 1920, Mr. John R. Fausey, then superintendent of schools in Winchester, Massachusetts, suggested to the present writer that the decision in such cases need not be made haphazardly on the basis of the exigencies of the circumstances, but could be arrived at scientifically through the use of intelligence test results. He proposed that children below the required chronological age limit might be tested if their parents desired to enter them in school, and that they be admitted if they obtained on the test a mental age which indicated that they would be able to complete successfully the work of the first grade or kindergarten, as the case might be.

After some discussion, the details of an experiment were arranged. The school committee modified its admission regulations so that the plan could be used.[1] It was decided to test the first grade candidates in small groups with the Dearborn General Intelligence Examination, Series I, and to give Stanford Binet tests to all those whose standing on the group test was doubtful, as well as to all kindergarten candidates. An advertisement was inserted in the local paper explaining the plan, and inviting parents who wished to take advantage of it to make appointments for examinations through the superintendent's office.

About twenty children were examined with the group test, and on the basis of the test results and observations made during the examination, about a quarter of the group were admitted and another quarter were eliminated. The middle half were examined individually with the Stanford Binet Scale, and a number of them attained satisfactory mental ages under the more favorable circumstances of individual examination.

[1] The present regulation reads, "Any child whose age is less than the required age, but whose mental age as determined by means of a standard mental test is of the required age, and whose physical condition is satisfactory, may be admitted to kindergarten or first grade upon the approval of the superintendent."

A few kindergarten candidates were also examined. Because it seemed wise to be conservative in the beginning of the experiment, it was decided not to admit a child unless he tested at least somewhat above the required chronological age,[2] and on this basis about a dozen were accepted.

These children did very well in their first year's work, so another set of examinations was given at the opening of school in the fall of 1921. A greater number of candidates appeared this time and a larger group was admitted. Towards the close of the school year the superintendent decided to make a careful investigation of the success of these children. For this purpose he sent to his first grade and kindergarten teachers a questionnaire in which the teacher was asked to rate each of the under-aged pupils by indicating in which quarter of the class he stood in each of the subjects he was taking. Statements were also required concerning the child's health, his interest in school work, and his social adaptability.

A third group of children was admitted in 1923, and at the end of this year another questionnaire was sent out to the teachers. When the papers were returned there were available the reports on from sixty to seventy underaged pupils, providing material for a fairly substantial inquiry into the success of the plan. A complete analysis of these data has been published elsewhere,[3] but a summary of the findings is set forth in Tables I and II of the present report. Briefly stated, the salient

TABLE I

SUMMARY OF THE FIRST STUDY

PERCENTAGE OF UNDER-AGED CHILDREN PLACED IN EACH QUARTER OF THE CLASS BY THE TEACHER'S RATINGS

| | 4 (Low) | 3 | 2 | 1 (High) | No. Cases |
|---|---|---|---|---|---|
| Reading | 6.4 | 1.7 | 40.3 | 51.6 | 62 |
| Spelling | 3.4 | 18.3 | 40.0 | 38.3 | 60 |
| Music | 11.3 | 19.4 | 40.3 | 29.0 | 62 |
| Penmanship | 4.8 | 32.3 | 46.8 | 16.1 | 62 |
| All Subjects | 6.4 | 16.9 | 42.1 | 34.6 | 266* |

*This total includes a few ratings in Language and Arithmetic besides those in the four subjects reported upon separately in this table.

TABLE II

SUMMARY OF THE FIRST STUDY

PERCENTAGE DISTRIBUTIONS OF THE TEACHER RATINGS OF UNDER-AGED CHILDREN AS REGARDS SOCIAL ADAPTABILITY, INTEREST, AND HEALTH

| | Poor | Fair | Good | Excellent | No. Cases |
|---|---|---|---|---|---|
| Social Adaptability | 8.5 | 7.0 | 18.3 | 66.2 | 71 |
| Interest in School | 2.8 | 1.4 | 29.6 | 66.2 | 71 |
| Health | 4.2 | 9.9 | 69.0 | 16.9 | 71 |

[2] This requirement was soon dropped because the admitted children did so well, as will be indicated later.

[3] Lincoln, E. A. "A Scientific Method of Determining the Fitness of Under-aged Children for School. *American School Board Journal.* February, 1924.

TABLE III

SUMMARY OF THE SECOND STUDY

A. PERCENTILE STANDINGS ON FOUR TESTS OF THIRTY-EIGHT UNDER-AGED CHILDREN ADMITTED AFTER EXAMINATION

| | Arith. | Read. | Spell. | Penman. |
|---|---|---|---|---|
| Mean | 48 | 59 | 55 | 49 |
| Median | 35 | 60 | 65 | 50 |
| Percent above the 75 percentile | 21.0 | 42.1 | 26.4 | 31.6 |
| Percent below the 25 percentile | 15.8 | 7.9 | 13.2 | 23.7 |

B. PERCENTILE STANDINGS ON FOUR TESTS OF THIRTEEN CHILDREN NOT ADMITTED

| | | | | |
|---|---|---|---|---|
| Mean | 53 | 31 | 33 | 44 |
| Median | 35 | 30 | 25 | 40 |

points of this first study were as follows: The under-aged children were highly successful in their academic work. From 16 to 52 percent were placed by their teachers in the upper quarter of their classes, and from 62 to 92 percent were placed in the upper half. Only from 3 to 11 percent were put in the lowest quarter, in spite of the fact that the children of this group were considerably younger than the average of their classmates. They stood high in social adaptability, 66 percent of the group being rated "Excellent," and only 8.5 percent being rated "Poor" in this respect. Their interest in school was eminently satisfactory, as only 2.8 percent received the rating "Poor," while 66 percent were classed as "Excellent." In the health ratings, 86 percent were "Good" or "Excellent," and only 4 percent were "Poor." A further interesting and important discovery was the fact that a fairly large number of the children obtained better scholarship ratings in grade II than in grade I.

A few years later, when the number of underaged children had been in school long enough to reach the third and fourth grades, another check on the success of the experiment was undertaken. All the third and fourth grade pupils in the town were given in June a series of four standard tests, and a study was made of the relative standing of the underaged pupils in their grades. The tests used were the Stone Reasoning Test in Arithmetic, the Burgess Picture Supplement Reading Test, Spelling words from the Ayres Scale, and the Dictation section of the Holmes Penmanship Test which was rated for quality on the Ayres Handwriting Scale.

A summary of the findings of this second study is presented in Table III.[4] Only 38 of the children admitted were in the third and fourth grades of the Winchester schools, but the performances of these

[4] For a complete report of this study see Lincoln, E. A. "Under-aged Children in the Lower Grades." *American School Board Journal*, Vol. LXXII, No. 3, March, 1926.

indicated very clearly the success of the plan. The mean percentile standing of these pupils was just about 50 in Arithmetic and Penmanship, 55 in Spelling, and 60 in Reading. In Reading, moreover, 42 percent of these pupils stood in the top quarter of their grades, and in no test were there as many as 25 percent found in the lowest quarter.

The present investigation was undertaken when some of the children had reached the seventh grade, and deals with pupils in the grades from four to seven, inclusive. The data became available when a town-wide survey was made which involved the testing of all the children in grades four to eight. The tests used were the Peet-Dearborn Arithmetic Tests, The Burgess Picture Supplement Reading Test, and the Holmes Penmanship Dictation Test. The arithmetic test gives two scores, the Problem score and the Average Operations score, so there were four measures of different scholastic abilities which could be utilized. All testing and scoring was done by trained workers of the staff of the Harvard Psycho-Educational Clinic.[5]

Before passing to a consideration of the test results it is worth while to note what happened to the group of under-aged children as a whole. In the first place, many children had left the school system altogether, so that it was possible to find only seventy-two of those who had been tested for admission. Fifty-four of these had been admitted and eighteen had been refused admission. Of the former, four were discovered to be in a grade behind the one in which they would have been if they had progressed regularly through the grades after admission. Here, it appears, is an indication that mistakes had been made in these cases, but other information shows clearly that this was not true. One of the four cases was taken out of school by his parents after only a few weeks of attendance because the death of a younger sister upset him emotionally to such an extent that he was clearly not able to go on with his work successfully. Another boy was ill during most of his second year at school, and could not keep up when tried in grade III. Since he had been absent from the middle of January to the first of June this is not surprising. The third case is that of a girl who attended only sixty-nine and one-half days during her third year, and so was forced to repeat. The fourth case was a girl whose mother became worried for fear she was going ahead too rapidly, and insisted that he should be held back a year. Neither the girl's teachers nor the primary supervisor thought that the repetition was necessary. Thus it appears that the test results were probably not at fault after all, and that no child who was admitted

[5] The data for this third study were made available through the courtesy of Mr. James J. Quinn, the present superintendent at Winchester.

on the basis of test results failed to keep on with his class because of a lack of mental ability.

The children who were tested in any year and who were refused admission were of course old enough to enter school in the regular way a year later. It is interesting to note that at the time when the standard tests were given, two out of the eighteen who were not admitted had lost a year each through repetition, and one child had lost two years. These losses were brought about by poor scholarship, and are further indications of the reliability of this method of selecting children for admission to school.

Now to return to a consideration of the test results. After the median and semi-interquartile range had been obtained for each test in each grade, it was possible to calculate the status of any child in any subject by subtracting the median from his individual score in that subject, and then dividing by the appropriate quartile deviation. The resulting numerical quantity, of course, tells the distance of the individual's score from the median in units of the semi-interquartile range, and may be called for convenience the Q position.

An illustration will make this process clear. In the fourth grade the median score on the Arithmetic Operations is 10.9, with a Q of 1.4. John's score on this test is 9.3. Subtracting the median from this score gives minus 1.6. Dividing by the Q, 1.4, gives minus 1.14 as John's Q position in Arithmetic Operations. In other words, he stands 1.14 Q below the median of his class.

The Q positions were calculated in each subject for each of the children who had been examined for admission, and from these data were obtained the results set forth in the following tables. Since it would have introduced an error to combine the standings of those who had gone along regularly through the grades with those who had dropped back a year or more, the latter were not used, and the tables present the results for fifty admitted and fifteen rejected children.

TABLE IV

THE STANDING OF FIFTY ADMITTED UNDER-AGED CHILDREN IN FOUR STANDARD TESTS

| Subject | Below Median | | Above Median | | Mean Q Standing |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| Reading | 12 | 24.0 | 38[a] | 76.0 | +.85 |
| Arith. Problems | 18 | 36.0 | 32 | 64.0 | +.53 |
| Arith. Operations | 15 | 30.0 | 35[a] | 70.0 | +.44 |
| Penmanship[b] | 31 | 63.3 | 18[a] | 36.7 | —.49 |
| All Subjects | 76 | 38.2 | 123 | 61.8 | +.33 |

[a] Includes one case exactly at the median.
[b] One child was absent when the penmanship test was given.

Table IV presents the numbers and percentages of the fifty admitted children above and below the class medians in each test, together with the mean Q standing in each subject. The table shows a number of noteworthy and interesting facts. The first of these is the general excellence of the underaged children. They are not only the equals of their classmates; they surpass them by a substantial margin, for nearly 62 percent are found in the upper half of the test score distributions, and the mean Q position is plus .35. Secondly, the excellence of the reading of these children is marked. Seventy-six percent of them are above the medians of their respective grades, and the mean Q standing is plus .85. Finally, there is an interesting divergence in the penmanship results, for only about a third of the group stand above the medians of their grades, and this is the one subject in which the mean Q standing is negative. This finding is in agreement with the results of the previous studies, both of which indicated that in penmanship these children are not so superior as in other subjects. Possibly this is because a certain degree of physical maturity is necessary for the development of whatever ability or abilities provide the foundation for penmanship.

TABLE V

NUMBER AND PERCENTAGE OF ADMITTED UNDER-AGED CHILDREN IN THE LOWEST AND HIGHEST QUARTERS OF THE TEST SCORE DISTRIBUTIONS

| Subject | Lowest Quarter No. | Lowest Quarter % | Highest Quarter No. | Highest Quarter % | No. Cases |
|---|---|---|---|---|---|
| Reading | 4 | 8.0 | 18 | 34.0 | 50 |
| Arith. Problems | 4 | 8.0 | 16 | 32.0 | 50 |
| Arith. Operations | 5 | 10.0 | 13 | 26.0 | 50 |
| Penmanship | 18 | 36.7 | 6 | 12.2 | 49* |
| All subjects | 31 | 15.5 | 53 | 26.6 | 199 |

* One child was absent when the penmanship test was given.

In Table V are shown the numbers and percentages of the admitted under-aged children in the lowest and highest quarters of the test score distributions. Here also the superiority of these children in reading and arithmetic is plainly indicated. It is especially worthy of note that only eight or ten percent of the group fall in the lower quarters of the distributions of scores in these subjects. The penmanship is again shown to be below the average.

TABLE VI

STANDING IN THE TESTS OF FIFTEEN CHILDREN NOT ADMITTED

| Subject | Below Median No. | Below Median % | Above Median No. | Above Median % | Mean Q Standing |
|---|---|---|---|---|---|
| Reading | 8 | 52.4 | 7 | 47.6 | —.07 |
| Arith. Problems | 8 | 52.4 | 7 | 47.6 | —.21 |
| Arith. Operations | 9 | 60.0 | 6 | 40.0 | —.18 |
| Penmanship | 9 | 60.0 | 6 | 40.0 | —.15 |
| All Subjects | 34 | 56.7 | 26 | 43.3 | —.15 |

TABLE VII

NUMBER AND PERCENTAGE OF THE REJECTED CHILDREN IN THE LOWEST AND HIGHEST QUARTERS OF THE TEST SCORE DISTRIBUTIONS

| Subject | Lowest Quarter | | Highest Quarter | | No. Cases |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| Reading | 3 | 20.0 | 3 | 20.0 | 15 |
| Arith. Problems | 4 | 26.7 | 3 | 20.0 | 15 |
| Arith. Operations | 4 | 26.7 | 2 | 13.3 | 15 |
| Penmanship | 5 | 33.3 | 4 | 26.7 | 15 |
| All Subjects | 16 | 26.7 | 12 | 20.0 | 60 |

The standings of the children who were not admitted are shown in Tables VI and VII. The figures in these tables show clearly that the children of this group as a whole would not have been likely to succeed had they been admitted, for they stand slightly below the median of the grades they are in at present. Possibly about a fifth of them might have been successful, yet even this is by no means certain, for only one of the group stands in the top quarter of his class in all four tests, and only one other is found in the second quarter in every subject.

TABLE VIII

NUMBERS AND PERCENTAGES OF ADMITTED AND REJECTED CHILDREN ABOVE THE MEDIANS OF THEIR GRADES IN VARIOUS NUMBERS OF TESTS

| | Above in 4 tests | Above in 3 tests | Above in 2 tests | Above in 1 test | Above in no tests | No. Cases |
|---|---|---|---|---|---|---|
| Admitted | | | | | | |
| No. | 10 | 15 | 17 | 6 | 2 | 50 |
| % | 20.0 | 30.0 | 34.0 | 12.0 | 4.0 | |
| Rejected | | | | | | |
| % | 13.3 | 26.7 | 6.6 | 26.7 | 26.7 | |
| No. | 2 | 4 | 1 | 4 | 4 | 15 |

Table VIII presents figures which make possible another interesting comparison between the children who were admitted and those who were not. This table shows the numbers and percentages of each group standing above or below the median in various numbers of tests. These figures again demonstrate the superiority of the admitted group, especially in the contrast in the percentage of children who fall below the median in three or four of the tests. Only 16 percent of the admitted children failed to stand above the median in at least two tests; 53.3 percent of those rejected were not able to get into the upper half of their groups in more than one test; and nearly 27 percent of them fall below the median in all four subjects.

The findings of the three studies which have been made on the later performance of these under-aged children all point to the conclusion that children admitted on the basis of mental age are not only able to main-

tain their scholastic accomplishment on equal terms with their classmates, but are decidedly superior in some phases of the work. This latter is especially true in the case of reading, the subject which is of more importance than any other after the pupil has passed through the first three or four grades. Furthermore, the results of two of the studies indicate that those children who were refused admission would not have been successful if they had been admitted, since most of them do not achieve a high standing even after they have come into school in the regular way a year later.

There is another indication of the success of this plan of admitting to school on the basis of mental age, not so scientific as these studies, but very pragmatic, and thus very important. This is the fact that the practice has grown tremendously since its small beginnings nearly a decade ago. Even before the results of the first study were published inquiries from superintendents began to come in, and one by one new communities have adopted the plan. At the beginning of the present school year the writer personally examined nearly four hundred children from twelve Massachusetts towns. Besides this there are several other towns in which the work is done by the regular psychological staff. Furthermore, it is worthy of special notice that no community which has once adopted the plan has later given it up.

It is fair to ask, in conclusion, What are the general implications of these studies? Granted that children who are admitted to school on the basis of mental age do very well after they get in, of what importance is this fact? Is the plan worth continuing and putting more widely into practice?

The writer believes that the plan is a very important and significant one because of two things which result from its operation. In the first place, it is a method of life saving. Each individual who is admitted has, in effect, a year of his life saved for him, since he is able to complete his education a year before he would be able to do it if he entered in the regular way. Many of these children are those who are going on to college and professional schools, and if a year can be saved in this long educational journey it is not only of great value to the individual himself, but is of much general social importance as well.

It is possible, of course, to object to the significance of this first point in the light of the present tendencies toward plans of ability grouping and individualized instruction under which the super-pupils may forge

ahead, and often save considerably more than a single year in the course of their schooling. There is a potent answer to this objection, however, in the fact that in none of the communities which have been admitting children on the basis of mental age is there any trace of modern individualized instruction, nor is there any serious attempt at ability grouping with provision for the rapid advancement of superior children.

This brings us directly to the second point, namely, that the plan is valuable as an entering wedge for the introduction of other desirable educational procedures and scientific methods. In one town the superintendent is ready to introduce ability grouping into the first grade. In another, the school board is beginning to see the necessity for a kindergarten. In a third community, the superintendent and school committee are seriously considering the plan of refusing to admit even the six-year-old to school unless he can pass a test showing that he is probably ready to profit by the work of the first grade. These are all cases in which the individuals concerned have been brought to the point of action largely because of the facts which the testing of the under-aged candidates for school has disclosed. More generally, there has been an increased acquaintance of teachers, superintendents, school board members, and the public at large with the nature and value of tests and testing. Knowledge of this sort can hardly fail to come to fruition at some future time in further development of scientific attitude and the further introduction of scientific method in dealing with the problems of education.

# AN OBJECTIVE BASIS FOR THE DETERMINATION OF THE OBJECTIVES AND MATERIALS FOR A COURSE IN BOTANY FOR SECONDARY SCHOOLS

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THE following investigation was undertaken to determine, first, the objectives and materials for a high-school course in botany as determined by social needs; second, to ascertain how nearly the materials presented in twelve widely used high-school textbooks compare with the materials discovered in the social fields; third, to obtain data that would adequately serve as a basis for organizing a high-school course in botany to meet social needs as they appear from the fields of human activities investigated.

In securing these data, it was first necessary to decide upon the fields of social activities to be examined and to select the media which would adequately represent interest in these fields. In determining the social activities to be investigated, a tentative list was first made of human activities performed in society. This list was large and the items in it were rearranged under more general headings. The following were considered to be the more basic activities with which one needs to be concerned: occupational activities, recreational and leisure time activities, unspecialized non-vocational activities, health activities, proper home activities, and citizenship activities. The major activities were determined by an analysis of large group action and by reference to published data which give the number of people participating in the activity in the various sections of the country; the products of the activities and the amount of these consumed by the public, whether plants or plant products were consumed in their execution; and the type of training, especially on the directed level, needed for high grade participation, etc.

The importance of selecting the best publications from which to select data within the field explored is apparent. Obviously, all publications need not be examined. In performing such a task, one needs to be governed only by such controlling factors found in valid assumptions or principles which are sufficiently general to permit choice, but sufficiently specific to determine which items are to be selected. The following assumptions, in the judgment of the author, conform to the above requirements and are sufficiently trustworthy to guide one in the selec-

tion of publications which would yield reliable data as a basis for organizing a high-school course in botany.

1. Before an adequate selection of publications to be examined for the purpose of securing material for a course of study for general training in any field can be made, a general classification of this material, based upon the interests and needs of society, must be made. This classification must be of such a nature as to include publications which represent the most important phases of society and varied human interests.

2. In securing data to be used in the organization of such a course of study designed for general training which will meet the needs of society, it is necessary to select sources that are trustworthy and that represent, in an adequate manner, the needs and interests of society in the fields which these sources propose to represent.

3. Since plants play an important role in many phases of modern society, one who would organize a course in botany designed for general training must examine those publications which deal with the most important and basic of these phases, and determine the kinds of botanical materials these contain. These must then form the basis of a course for botanical study, if the general interests and needs of society are to be of major importance.

4. Periodicals which are devoted to technical discussions of botanical matters are designed for people on the upper levels of training, and, therefore, do not present suitable materials for general training on the high-school level.

5. Periodical publications which discuss plants in their relation to industries in which large numbers of people are engaged and upon which the welfare of the nation depends contain valuable material for a course in botany for high-school training.

6. Periodical publications which deal with plants in their relation to home environment, or the environment of places where people resort for leisure and recreational purposes contain excellent materials for a course in botany designed for general training.

7. Any course in botany designed for general training should present the problems concerning plants in their relation to health. Journals devoted to discussion of health problems should therefore contain much material of general interest.

8. A course in botany designed for general training will contain material which pertains to plants in their food relations. Periodic liter-

ture which concerns itself with plants as a source of food should be examined by the curriculum maker for the purpose of ascertaining the nature and character of the materials presented and the adaptability of these for botanical study.

9. Periodicals, bulletins, etc., which discuss the plant interests of the nation, as for example our forests, our wild flowers, introduction of new species of plants, laws governing national or state plant interests, etc., will contain many matters of general interest and should therefore be examined by one who designs to ascertain botanical objectives and materials for a course of botany for general training on the high-school level.

10. The larger the number of published sources that discuss the problems of society in its relation to plant life that is canvassed, the greater is the likelihood of securing data for the construction of a course in botany that will be thoroughly representative of the needs of society.

11. Data which reveal the knowledge, interests, attitudes, ideals, abilities, habits, disposition, and skills which are needed by society constitute reliable material from which the objectives for a course of study for high-school training may be deduced. In constructing a course designed to achieve these ends in the interests of society, sources which yield these data should be examined.

Guided by the foregoing principles and by reference to the list of major social activities already referred to, the following classification was arranged and the specific publications as they appear in each class were selected and the issues for approximately thirteen years (from 1910-1923) were examined in detail, from which data were secured which were used in this investigation.

1. General Reading—*Literary Digest*, public health bulletins, *Country Gentlemen*, and *Good Health*.

2. General Science—*Popular Science Monthly*, *School Science and Mathematics*, *Scientific American*, *Science*, *National Geographic Magazine*, reports of botanical gardens.

3. Agriculture—U. S. Department of Agriculture bulletins, U. S. Department of Agriculture Year Books, Reports of the U. S. Bureau of Plant Industry, U. S. Farmer's Bulletins, publications of experiment stations located in representative sections of the country; namely, California, Iowa, Kansas, Kentucky, Texas, Utah, Vermont.

4. Horticulture—Proceedings of horticutural societies.
5. Forestry—*American Forestry Journal, American Lumberman,* U. S. Forestry Service *Bulletin.*
6. Home Economics—*Journal of Home Economics.*
7. Pharmacy—*American Journal of Pharmacy.*
8. Miscellaneous publications, books, etc.

As this large amount of literature was examined, page by page (an amount equivalent to more than 10,000 pages of the ordinary botanical textbook) notes were taken on 3 x 5 cards first, of the groups of plants and also, when necessary, the specific plants, being discussed; and, second, what particular activities or relations were being considered in connection with the various plants or plant groups.

These data, after being gathered from these various sources, were classified in the following manner. The data cards were examined, one by one, and notes taken of all the plant groups that were considered. A tabular list was then arranged and the data cards were classified under these various headings. For example, one of the plant group was "Legumes." All of the cards that contained notes relating to this group, or individual members of the group, were put in one pile and the collection designated "Data on Legumes." Twenty-three such piles were thus secured. This enabled the author to determine the number and the nature of the discussions about plants and plant groups in the various periodicals.

It was necessary also to determine specifically the nature of the discussions. The cards were again examined and a list made of the various activities or relations of the plants or plant groups under consideration. Nineteen items appeared in this list. For example, one of the "Activities and Relations" items was "Adaptation." Whenever, therefore, the adaptation of legumes was under consideration in the literature examined, a check was made in the proper place on an ordinary distribution table—one part of which (the left) contained the "Plant Groups" the other part (the top) the "Activities and Relations." Thus when all the cards had been examined and the proper notations made it was a very easy matter to determine the number of times any plant group had been discussed in some specific relation or activity. The data gathered in this manner are presented in Table I.

This table is of special interest in that it shows, first, the plant groups that were discussed by the writers in the literature examined; second, the plant activities and relations that were considered by these writers

TABLE I

NUMBER OF DISCUSSIONS OF PLANT ACTIVITIES AND RELATIONS IN CONNECTION WITH PLANT GROUPS THAT APPEARED IN CERTAIN PERIODICAL LITERATURE

| No. of Line | PLANT GROUPS | 1 Adaptation | 2 Composition | 3 Control of Disease | 4 Conservation and Protection | 5 Culture | 6 Description | 7 Distribution | 8 Destruction | 9 Function | 10 Habitat | 11 History | 12 Improvement | 13 Name | 14 Reproduction | 15 Reforestation | 16 Seed Testing | 17 Structure | 18 Use | 19 Varieties | 20 Miscellaneous | 21 Total | 22 Average | 23 Percent of Total No. of Discussions | 24 No. of Pages |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Bacteria | 8 | | | | 5 | 1 | 14 | 16 | 3 | 12 | 2 | | 1 | 2 2 | | | | 2 | 2 | | 68 | 5.6 | 3.36 | 338 |
| 2 | Cacti-Desert Plants | 3 | | | | | 5 | 3 | | 1 | | 2 2 | | 1 | | | | | | | | 22 | 2.2 | 1.08 | 109.4 |
| 3 | Cereals | 20 | 13 | 15 | | 25 | 16 | 4 | | 10 | | 9 | 32 | 4 | | | 14 | 7 | 14 | 22 | 1 | 206 | 13.7 | 10.12 | 1023.8 |
| 4 | Citrous Fruits | 1 | | 5 | 1 | | 1 | | | | | 3 | 2 | | 5 | | | | 1 | 4 | | 23 | 3.2 | 1.13 | 114.3 |
| 5 | Deciduous Fruits | 9 | 2 | 25 | 7 | 18 | 5 | 3 | | 10 | | 4 | 14 | 4 | 10 | | | 9 | 13 | 27 | | 160 | 10.6 | 7.9 | 795.2 |
| 6 | Diseases of Plants | | | | | | 40 | 32 | 36 | | | 15 | | 1 | | | | | | | | 124 | 20.6 | 6.12 | 616.3 |
| 7 | Fiber Plants | 2 | 1 | 2 | | 4 | 2 | 4 | | 3 | | 4 | 5 | | | | | 3 | 11 | 3 | | 44 | 3.6 | 2.12 | 218.7 |
| 8 | Flowering Plants | 8 | | 4 | 7 | 14 | 8 | 4 | | 16 | 6 | 6 | 6 | 9 | 5 | | | 6 | 10 | 7 | | 116 | 7.7 | 5.73 | 576.5 |
| 9 | Forage Plants | 12 | 4 | 7 | 2 | 14 | 5 | 4 | | 7 | | 6 | 9 | 3 | 2 | | 1 | 3 | 23 | 6 | | 108 | 6.7 | 5.33 | 536.8 |
| 10 | Forests | | | 2 | 15 | | 3 | 5 | 7 | | | 6 | | 1 | 4 | 13 | | | 22 | | | 78 | 7.8 | 3.31 | 387.7 |
| 11 | Fungi | 4 | | | | 3 | 11 | 2 | 10 | 7 | 1 | 3 | | 2 | 7 | | | 4 | 2 | 1 | 1 | 58 | 4.1 | 2.86 | 288.3 |
| 12 | Grasses | 6 | 1 | 4 | 1 | 6 | 4 | 2 | | 2 | 2 | 1 | 1 | 5 | 4 | | 4 | 2 | 7 | 2 | | 54 | 3.1 | 2.66 | 268.4 |
| 13 | Fruiting Pl'ts (Herbaceous) | 1 | | 5 | | 9 | 5 | 1 | | 2 | | 4 | 3 | | 3 | | | 1 | 3 | 2 | | 39 | 3.2 | 1.92 | 193.8 |
| 14 | Legumes | 3 | 3 | 1 | 1 | 8 | 5 | 2 | | | | 3 | 5 | 1 | | | | 3 | 15 | 5 | | 56 | 4.3 | 2.75 | 288.3 |
| 15 | Medicinal and Poisonous Plants | 3 | 14 | 5 | 3 | 35 | 10 | 9 | | 5 | 6 | 13 | 6 | 2 | 3 | | 2 | 1 | 20 | | | 137 | 8.5 | 6.67 | 681.9 |
| 16 | Roots and Tuber Plants | | | 8 | 1 | 10 | 1 | 1 | | 1 | | 3 | 5 | 1 | 4 | | | 1 | 7 | 7 | | 50 | 3.8 | 2.46 | 248.5 |
| 17 | Seaweeds | | 5 | | | | 1 | 4 | | | | 1 | | | 1 | | | 1 | 8 | | | 21 | 3.0 | 1.03 | 104.4 |
| 18 | Shrubs | 4 | 3 | 5 | 3 | 22 | 11 | 9 | 1 | 2 | 1 | 5 | 2 | 7 | 5 | | | 4 | 18 | 16 | | 118 | 6.9 | 5.83 | 586.5 |
| 19 | Sugar Producing Plants | 4 | 2 | 3 | 2 | 11 | 4 | 2 | | 1 | | 7 | 3 | | 3 | | | 1 | 9 | 1 | | 53 | 3.7 | 2.61 | 263.4 |
| 20 | Trees | 15 | | 20 | 9 | 12 | 33 | 21 | 3 | 20 | 3 | 10 | 3 | 14 | 23 | 8 | | 23 | 58 | 15 | 5 | 292 | 16.2 | 14.42 | 1451.2 |
| 21 | Tropical Fruit Plants | 2 | | 2 | 1 | 6 | | 2 | | 1 | 2 | 2 | 1 | 1 | 8 | | 1 | | 7 | 5 | 1 | 42 | 2.8 | 2.07 | 208.7 |
| 22 | Veg. Garden Plants | 2 | 4 | 8 | | 27 | 1 | | | 5 | | 4 | 3 | 2 | 5 | | 5 | | 3 | 8 | | 77 | 5.9 | 3.31 | 382.7 |
| 23 | Weeds | | | | | | 15 | 2 | 14 | 3 | 2 | 1 | | 1 | 2 | | | | 2 | 1 | | 46 | 4.6 | 2.27 | 228.6 |
| 24 | Miscellaneous | 6 | 1 | 3 | | | | 3 | | 6 | 1 | | 3 | 1 | | | | 1 | 7 | | | 32 | 3.2 | 1.58 | 159. |
| 25 | Totals | 113 | 53 | 124 | 53 | 229 | 197 | 132 | 87 | 105 | 36 | 114 | 104 | 61 | 98 | 21 | 27 | 71 | 265 | 136 | 8 | 2024 | | | |
| 26 | Average | 5.9 | 4.4 | 7 | 4 | 13 | 8.5 | 6 | 12.4 | 5.5 | 3.6 | 4.9 | 6 | 3.4 | 5.1 | 10 | 4.5 | 4.1 | 11.9 | 7.1 | 2 | | | | |
| 27 | Percent of Total Number of Discussions | 5.55 | 2.61 | 6.12 | 2.61 | 11.33 | 9.28 | 6.52 | 4.29 | 5.13 | 1.77 | 5.63 | 5.13 | 3.01 | 4.34 | 1.03 | 1.33 | 3.5 | 13.09 | 6.7 | .4 | | | | |
| 28 | Number of Pages | 561.6 | 263.7 | 616.3 | 263.4 | 1138.1 | 929.4 | 706 | 432.4 | 521.9 | 178.9 | 566.6 | 516.9 | 303.2 | 487.1 | 104.4 | 134.3 | 352.9 | 1320.1 | 675.9 | 39.8 | 10059.3 | | | |

in connection with the various members of the groups or of the plant groups themselves; third, the relative prominence of each of these in its connection with the other, as it appeared in the literature examined. Attention is especially called to columns 23 and 24 and to lines 27 and 28. The percent of the total number of discussions[1] and also the approximate number of pages contained in the literature examined (in the first instance of the various plant groups and in the second, of the activities and relations) are here presented.

In such data as these one finds justification for the relative prominence given to certain plant groups and specific activities and relations in both the lists of objectives and in the course of study based upon these.

How nearly does that which is actually presented in the literature coincide with that which is offered in the high schools as judged by that which is offered in the textbooks on botany? To secure data that would help to answer this question, the materials in twelve widely used botanical textbooks which had been published by six of the leading publishers in America were examined in the following manner. First a table similar to Table I was prepared.[2] As the textbooks were examined page by page note was taken of, first, the plants or plant group under consideration; second, what was being said about the particular plants or plant group; and, third, the number of pages, or the fraction of a page, devoted to this particular discussion.[3] These three items having been determined, numerical notation was made in the proper blank on the table. For example, if a certain author devoted 2½ pages of his text to the distribution of trees of a certain species, the numerical notation "2½" would be made under the column heading "Distribution" in the line headed "Trees."

Each of the textbooks was thus carefully examined. The data from twelve texts were assembled in one table. Lack of space prevents the publication of these data. An inspection of these tables leads one to the conclusion that the authors of the texts for high-school botany are not

[1] A "discussion," as the word appears in Table I and throughout this study, is a presentation of significant factual material about plants or plant groups in connection with important activities or relations containing, on the average, 1650.8 words or 4.97 pages of the ordinary high-school textbook in botany.

[2] It was soon found, too, that it was necessary to add one more item in the plant group column, namely "Lower Forms" to include those forms that could not be classified under the groups already provided.

[3] In all cases mere references were ignored. See note defining discussion.

in unaminity either as to the type of botanical materials that should be administered on the high-school level or the purposes these materials are to serve in the lives of the students.

Table II shows the actual and also the relative emphasis, expressed as percent of space, given to the various plant groups and the plant activities and relations by the writers in the two types of literature.

TABLE II

COMPARISON OF TOTAL PERCENTS OF NUMBER OF DISCUSSIONS IN PERIODICAL LITERATURE WITH THE PERCENT OF TOTAL NUMBER OF PAGES OF TEXTBOOK LITERATURE CONCERNING PLANT GROUPS AND CERTAIN PLANT ACTIVITIES AND RELATIONS

| PLANT GROUPS | PER. LIT. | TEXTBOOK LIT. | PLANT ACTIVITIES AND RELATIONS | PER. LIT. | TEXT LIT. |
|---|---|---|---|---|---|
| Bacterial | 3.36 | 2.81 | Adaptation | 5.55 | 10.6 |
| Cacti Desert Plants | 1.08 | | Composition | 2.61 | .3 |
| Cereals | 10.12 | 1.25 | Control of Diseases | 6.12 | 1.2 |
| Citrous Fruits | 1.13 | .09 | Conservation and Protection | 2.61 | .8 |
| Deciduous Fruits | 7.9 | 1.71 | Culture | 11.33 | .43 |
| Diseases of Plants | 6.12 | 1.39 | Description | 9.28 | 19.4 |
| Fiber Plants | 2.12 | .1 | Destruction | 6.52 | 1.64 |
| Flowering Plants | 5.73 | 2.0 | Distribution | 4.29 | 2.2 |
| Forage Plants | 5.33 | .02 | Function | 5.13 | 16.0 |
| Forests | 3.31 | 1.5 | Habitat | 1.77 | .19 |
| Fungi | 2.86 | 4.45 | History | 5.63 | 19.6 |
| Grasses | 2.66 | | Improvement | 5.13 | 1.86 |
| Fruiting Plants (Herbs) | 1.92 | | Name | 3.01 | 1.71 |
| Legumes | 2.75 | .58 | Reproduction | 4.34 | 6.62 |
| Lower Forms (not otherwise listed) | | 13.4 | Reforestation | 1.03 | .1 |
| Medicinal and Poisonous Plants | 6.67 | .19 | Seed Testing | 1.33 | |
| Roots and Tuber Plants | 2.46 | | Structure | 3.5 | 22.2 |
| Seaweeds | 1.03 | | Uses | 13.09 | 2.72 |
| Shrubs | 5.83 | | Varieties | 6.7 | .04 |
| Sugar Producing Plants | 2.61 | .1 | Miscellaneous | .4 | 10.7 |
| Trees | 14.42 | 4.02 | | | |
| Tropical Fruit Plants | 2.07 | | | | |
| Veg. Garden Plants | 3.31 | .92 | | | |
| Weeds | 2.27 | 1.12 | | | |
| Miscellaneous | 1.58 | .38 | | | |

The differences in points of view of those who write articles about plants and plant activities and relations for current periodical publications which represent human interests in many fields and are intended to be read and appreciated by the public generally and those who write the textbooks on botany for the high-school students and teachers are clearly shown in Table II. Three comparisons which indicate these differences are especially noteworthy. They are:

First, the writers of periodical literature emphasized the food producing groups of plants (Cereal Plants, Citrous Fruit Plants, Deciduous Fruit Plants, Roots and Tuber Plants, Sugar Producing Plants, Tropical Fruit Plants, and Vegetable Garden Plants) by devoting 29 percent of

all the space at their disposal to these groups while the textbook writers devoted only 4 percent of their book space to these groups. In other words, the former devoted more than seven times more space, relatively, to a consideration of these important groups than did the latter.

Second, the writers of the textbooks devoted 20.6 percent of space to a discussion of the lower forms of plant life, including Bacteria, and Fungi, while the writers of the periodical literature devoted only 6.2 percent of their space to a consideration of these plant forms. The major part of this latter discussion was devoted to the lower forms in relation to health and disease of the higher plants, animals, and man. In other words, the textbook writers devoted, proportionately, over three times the space to discussions relating to lower forms of plant life than did the writers of the periodical literature examined.

Third, the writers of the periodical literature examined devoted 43.7 percent of space to the economic phases of plant life (namely, uses, culture, varieties, distribution and control of disease) while the textbook writers devoted only 6 percent of space at their disposal to these phases. Again, here is a difference of more than seven times more attention, relatively, to the economic phase of plant life devoted by the writers who produce literature for general reading than by those who write the textbook materials for high-school students.

A course of study in botany for general training, also the objectives to be achieved through pursuing such a course based on the foregoing data, clearly must emphasize the economic phases of plant life. In the light of these data, there is need for shifting the emphasis in plant studies in courses designated for general training from the lower to the higher forms of plant life and for discussing these forms in their relations to human welfare.

# A CORE VOCABULARY FOR ELEMENTARY SCHOOL PUPILS

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In the construction of any curriculum, one important step is to discover those experiences, thoughts and emotions which function in the daily life of the average student. In considering a vocabulary for elementary students, it is important that we should know those words which the student uses in his daily life outside as well as in the school room.

Under the direction of Dr. John C. Almack of Stanford University, the writers have carried on an association study of the vocabulary of grade children. One of the aims of this study was to discover those words that hold the most important place in the daily vocabulary of the child of elementary school age. The importance of these words was judged on the basis of richness of association.

The association method was used in this study. Four hundred stimulus words were chosen, representing all phases of the experience and environment of the elementary child. These words were arranged in eight lists of fifty words each.

The eight lists were submitted to fifty students in each of the grades IV to VIII inclusive, who were selected from eleven elementary schools in California and Oregon. The tests were given so that no one group of students responded to more than one list of stimulus words. After each stimulus word, space was left for the student to write in four or five words which he associated most closely with the stimulus word. Since some of the schools failed to return all the lists, the actual number of children whose papers were checked amounted to 1851.

After the tests were returned from the various schools, all response words were carefully tabulated. This tabulation showed a total list of all words arranged in alphabetical order, the total frequency of each word appearing in any or all of the grades studied, and the number and frequency of all words appearing in each grade. The results of the study gave 4515 different words appearing with a total frequency of 230,631 words. Of the 4515 different words appearing, 1309 words were common to all grades. A more complete description of method and technique, and an analysis of the high frequency words, and a comparison

with other word studies was reported in the *Journal of Educational Research* for June, 1928[1]

Perhaps the most significant result of this study is the list of 1309 words that are common to all grades. The fourth grade pupils responded with 2102 different words; and 1309, or 62 percent of that number, appeared in all the higher grades. This indicates that the majority of the fourth-grade words are fundamental to the experience and life of the elementary-school pupil since they are retained in all the grades.

The list has been checked against Thorndike's *The Teacher's Word Book* and Horn's *A Basic Writing Vocabulary*. Words not preceded by any numeral appear in the given form in both lists. Those preceded by a numeral are to be interpreted in accordance with the footnotes at the bottom of the first page of the list. One thousand one hundred fourteen of these 1309 words occur in both the Thorndike and Horn lists in the form given herein. One hundred fourteen words appear in the Thorndike list but not in Horn's. Thirty-two appear in Horn's but not in Thorndike's in the form given; each of these, however, could be built up from a form appearing in the Thorndike list by adding a suffix which he did not count separately. Twenty-seven words appear in neither the Thorndike nor the Horn list. Eleven words appear in the Horn list but not in the Thorndike and could not be built up by the addition of suffixes which Thorndike included under his basic form. Eleven words appear in neither Horn nor Thorndike but could be built up from a form in Thorndike by adding a suffix which he did not count separately. Hence 1146 or nearly 88 percent of these words are common to all three lists—this list, Thorndike's and Horn's. Ninety-seven percent of this list was certainly or probably included in Thorndike's list of ten thousand.

Several requests have been received for a list of these 1309 words. With the hope that these words may be of interest to other students of research, and that some one may be interested in carrying the investigation farther, the writers submit for publication the following 1309 words which they believe constitute a core vocabulary of the elementary students.

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[1] Shambaugh, C. G., and Shambaugh, Olive L. "An Association Study of the Vocabulary of Grade Children." *Journal of Educational Research*, XVIII (June 1928), 40-47.

accident
ache
act
address
afraid
after
afternoon
[4]agate
air
airplane
alfalfa
[1]America
angry
animal
[1]ant
apartment
apple
[1]apricot
apron
arithmetic
arm
around
artist
ashes
asleep
attic
aunt
auto
automobile
autumn
away
awful
[1]axe

baby
back
bacon
bad
bake
baker
[3]baking
ball
[3]balloon
banana
band
bandage
bank
banquet
bar
barber
bark
barley
barn
baseball
basement
basin
basket
[4]basketball
bat
bath
bathe
[3]bath tub
battle
battery
bay
beach
[3]beads
[3]beans
bear
beard
beat
beautiful
beauty
bed
bedroom
beef
beer
[3]bees
[3]beets
bell
belt
bench
[3]berries
bicycle
big
bill
bird
birth
bite
bitter
black
[1]blade
blanket
[3]bleat
[3]bleed
blind
block
blood
bloom
blossom
[3]blotter
blow
blue
board
boat
[3]bobbed
body
boil
bone
bonnet
book
boot
born
bottle
bow
bowl
box
boy
bracelet
brain
branch
brass
bread
break
breakfast
breath
brick
bright
bring
broken
brook
broom
brother
brown
brush
bucket
bud
bug
buggy
build
building
bull
bump
[1]bun
bunch
burden
bureau
burn
bush
butcher
butter
button
buy

cabbage
cake
calf
[1]California
call
came
camera
camp
[2]camping
can
candy
cap
cape
car
card
care
carpenter
carpet
[1]carrot
carry
case
[1]castor oil
cat
catch
[1]caterpillar
cattle
ceiling
cellar
cement
cent
[1]cereal
chain
chair
chase
check
cheek
cheer
cheerful
cheese
[3]cherries
chest
[1]chew
chicken

[1] In Thorndike's list but not in Horn's.
[2] In Horn's list; not in Thorndike's in this form but could be built up from a form therein by adding a suffix which he did not count separately.
[3] In neither Thorndike's nor Horn's list.
[4] In Horn's list; not in Thorndike's and could not be built from any form given.
[5] In neither Horn's nor Thorndike's list in present form but could be built up from the form in Thorndike's list by adding a suffix which he did not count separately.

child
children
chimney
china
[1]Chinese
chip
chocolate
chop
[1]Christ
Christmas
[1]cider
cigar
cigarette
[5]cinnamon
circus
city
class
clay
clean
cleaner
[2]cleanliness
clear
climb
clock
close
closet
cloth
clothes
clothing
cloudy
clover
[1]clown
coal
coat
[1]cob
[1]cobweb
cocoa
coffee
cold
collar
color
colt
comb
come
comfortable
company
cook
[2]cookies
[2]cooking
cool
copper
copy
[1]core
cork
corn
corner

[1]cot
cotton
couch
cough
country
cousin
cover
cow
cozy
crack
[6]crackers
cradle
[5]cranberries
crawl
[1]crayon
crazy
cream
creamery
creek
creep
cross
[1]crow
cry
cup
cupboard
curly
curtain
cushion
[1]custard
cut
cute

dad
dairy
dance
danger
dangerous
dark
date
daughter
day
dead
dear
death
decoration
deep
deer
delicious
desk
[1]dessert
diamond
different
dig
dinner
dirt
dirty

discover
disease
dish
[1]dive
[3]diver
doctor
dog
doll
dollar
done
[1]donkey
door
[1]dot
dough
down
drawer
draw
dream
dress
dresser
[2]dressing
drill
drink
drive
drop
drown
drum
drunk
dry
duck
dull
dust
[1]duster

ear
earth
Easter
easy
eat
egg
electric
electricity
[1]elephant
embroidery
[5]emi
end
engine
[1]England
entertainment
envelope
[1]eraser
exercise
eye

face
factory

fair
fall
[1]fan
fancy
far
farm
farmer
fast
fat
father
faucet
feather
feed
feel
feet
fence
fern
field
fig
fight
fill
film
find
fine
finger
fire
fireplace
fish
[2]fishing
fist
fix
[1]flake
flat
flax
[1]flea
[1]float
floor
flour
flower
fly
[1]fog
fold
food
foot
football
Ford
forest
fork
found
four
[1]fowl
[1]fox
frame
free
freeze
[5]freckles

fresh
friend
frighten
front
frost
frown
fruit
fry
fuel
full
fun
funny
fur
furnace
furniture

game
garage
garbage
garden
[1]garlic
[1]garter
gas
[1]gasoline
gate
gather
gay
geese
[1]geranium
ghost
gift
gingham
girl
give
glad
glass
glove
glue
goat
gold
good
goose
gown
grab
grain
grand
grandfather
grandma
grandpa
[1]grapefruit
[1]grapes
grass
gravel
gravy
gray
grease

great
green
grin
grind
[2]groceries
grocery
ground
grove
grow
guide
gum
gun

hail
hair
Halloween
ham
hammer
[1]hammock
hand
handkerchief
handle
hang
[1]hanger
happiness
happy
hard
harm
[1]harp
hat
hatchet
hate
have
hay
head
health
healthful
healthy
hear
heart
heat
heater
heavy
heel
hello
help
[1]hemstitch
hen
hide
high
[4]hike
hill
[1]hinge
hit
hoe
hog

hold
hole
holiday
[3]holler
home
homely
honey
honor
hook
hop
horn
horse
hose
hot
hour
house
hungry
hunt
hurry
hurt

ice
[4]ice cream
ill
Indian
ink
[1]insect
instrument
iron

jacket
[3]jack-o-lantern
jam
January
[1]Japan
[1]Japanese
jar
jaw
[3]jello
jelly
jewelry
joint
joke
jolly
joy

keep
kettle
key
kick
kill
kind
king
kitchen
kitten
knee

knife
knit
[1]knob
knock
[1]knuckle
kodak

lace
ladder
lady
lake
lamb
lamp
land
lane
lap
lard
large
last
late
[3]lather
laugh
laundry
lawn
lay
lazy
lead
leaf
leather
leave
leg
lemon
lemonade
lesson
letter
lettuce
liberty
lick
[1]lid
lift
light
like
[1]lily
line
linen
lion
[2]lips
listen
little
live
load
lock
log
long
look
lose

lost
lot
loud
love
low
lumber
lunch

machine
machinery
mad
magazine
mail
make
mamma
man
mantle
map
maple
marble
march
mark
market
[1]mash
mat
match
material
mattress
may
meadow
meal
mean
[4]measles
meat
medicine
[1]melon
mend
[1]meow
merry
message
mice
milk
mill
mirror
mischief
mist
misty
mitten
mock
[1]mole
money
monkey
moonlight
mop
more
morning

moth
mother
motor
motorcycle
mountain
mouse
mouth
move
[4]movie
[1]mow
much
mud
muddy
[5]muffins
mule
[1]muscle
[1]mush
music
mutton

nail
name
[4]napkin
[4]nasty
nature
naughty
neat
neck
necklace
necktie
needle
negro
nephew
nest
net
new
news
newspaper
[1]New York
nice
nickel
night
[1]nipple
noise
noisy
noon
nose
note
nurse
nut

oak
[2]oatmeal
oats
ocean
office

oil
[1]oily
old
olive
onion
open
orange
[2]orangeade
orchard
orchestra
organ
ornament
[2]others
outside
oven
over
overalls
[1]oxen
oyster

pack
package
paddle
page
pail
pain
paint
painter
palm
pan
[1]pansy
pantry
[2]pants
papa
paper
parade
parasol
[2]parents
park
parrot
part
party
paste
[1]pastry
pasture
[4]patches
path
pay
peace
[2]peaches
[2]peanuts
pear
[2]pearls
[2]peas
[1]pedal
[1]peel

[5]peeling
pen
pencil
penny
people
pepper
perfume
person
pet
[1]petal
petticoat
phone
[4]phonograph
piano
pick
[1]picket
[2]pickles
picnic
picture
pie
piece
pig
[1]pigeon
pillow
[5]pimple
pin
pine
pink
pipe
pit
pitch
pitcher
[5]pitchfork
place
plane
plant
plate
[1]platter
play
pleasant
pleasure
plow
[1]plumber
[5]plums
pocket
poem
point
poison
pole
pond
pool
poor
pop
[4]popcorn
[1]porcelain
porch

pork
post
post office
pot
[2]potatoes
poultry
pound
powder
practice
present
preserve
press
pretty
prince
[1]princess
print
prune
pudding
puff
pull
pump
pumpkin
punch
purple
purse
push
put

quarrel
quick
quilt

rabbit
race
rack
racket
radiator
radio
[1]radish
rag
rain
rainy
raisin
raise
rake
ranch
[1]raspberries
rat
[1]rattle
raw
razor
read
[2]reading
recess
red
relation
rest
restaurant
ribbon
rice
rich
ride
right
[1]rim
ring
roast
robe
rock
[2]rocking
roll
roof
room
[1]rooster
root
rope
rose
rotten
rough
round
rub
rubber
rug
[1]ruler
run
rush

sack
sad
saddle
salad
[1]salmon
salt
[2]salty
same
sand
sandwich
[1]San Francisco
[1]Santa Claus
sash
satin
Saturday
sauce
[1]saucer
save
saw
scare
scarf
scenery
school
scissors
scout
scrap
scrape
scratch
screw
scrub
sea
seal
[2]seasoning
seat
see
seed
seek
send
serve
sew
[2]sewing
shade
shake
shape
sharp
shave
[1]shawl
[1]shear
shed
sheep
sheet
shelf
shell
shelter
shepherd
[1]shin
shine
shingle
ship
shirt
shoe
shoot
shop
short
shot
shoulder
shout
shovel
show
shut
sick
sickness
side
sidewalk
sign
silly
silk
silver
sing
sink
sister
sit
skate
skill
[2]skillet
skin
skirt
sky
[1]slap
sled
sleep
sleepy
slide
slip
slipper
slippery
[1]slop
slow
small
smash
smell
smile
smoke
smooth
snake
[4]snapshot
snow
soak
soap
sock
soda
sofa
soft
soil
soldier
some
something
son
song
[1]soot
sore
sound
soup
sour
south
[1]spade
speak
[2]spelling
spice
[1]spider
spill
spin
split
spoil
sponge
spoon
sport
spot
[2]sprain
spread
spring
square

squirrel
stable
stack
stage
stair
stall
stamp
stand
[1]starch
steak
steam
steal
steel
steer
stem
step
[1]stew
stick
[2]sticker
[1]sticky
stiff
still
[1]sting
stir
stock
stocking
stomach
stone
stool
stop
store
storm
stormy
story
stove
straight
strap
straw
[1]strawberry
stream
street
stretch
strike
string
strong
stuck
study
stump
style
[2]suds
sugar
suit
summer
sun
Sunday
sunny
supper
swallow
sweat
sweater
sweep
sweet
swell
swim
[2]swimming
swing
sword
syrup

table
tablet
tack
[2]taffy
tag
tail
take
talk
tall
tan
tank
taste
tax
tea
teacher
team
tear
teeth
telephone
tell
tender
tennis
tent
terrible
Thanksgiving
theater
thick
[1]thimble
thin
thing
think
thread
throat
through
throw
thumb
thunder
[1]tick
tie
[1]tiger
tight
time
[1]tin
tip
tire
toast
tobacco
toe
together
tomato
tongue
[4]tonsils
[2]tools
tooth
top
tough
towel
tower
town
toy
train
trap
[1]trash
travel
tree
trick
trim
truck
true
trunk
tub
tube
tune
turkey
turn
[1]twig

ugly
uncle
under
underwear
unhappy
use

vacation
valentine
[1]vanilla
varnish
[1]vase
[1]veal
vegetable
vest
vine
vinegar
[1]vineyard
violet
violin
visit
voice

[2]waffles
wagon
waist
wait
walk
wall
war
warm
warmth
wash
[2]washing
watch
water
[1]wax
wear
weather
[1]web
wedding
weed
week
weep
well
wet
wheat
wheel
whip
[2]whiskers
whistle
white
[1]wick
wide
[2]wieners
wife
wild
wind
window
wine
wing
winter
wipe
wire
wish
wolf
woman
wood
wooden
wool
word
work
world
[2]worms
worry
wrap
wreck
wrestle
[1]wrinkle
wrist
write

yard
yarn
year
yell
yellow
young

[1]zinc

# A SOURCE OF CONFUSION IN SPELLING

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APPERCEPTION is no longer a word to conjure with in education. It has given away to more enticing, although no more significant terms. It is a pity that the introduction of the methods based on Herbartianism was not accompanied by careful scientific study of the way in which past experiences operate in determining the child's reaction to a new situation. That these past experiences must be taken into consideration is beyond question. To this extent the principle of apperception is supported by common sense, by data from experimental psychology, by the results of experiments in education, and even by the contributions of psychoanalysis. Indeed, there are published papers on psychoanalysis which, with slight changes in terminology, would have elicited no surprise had they appeared thirty years ago under the title "apperception." The prominence given to diagnostic and remedial teaching indicates that in the near future students of education will attach greatly increased importance to the study of the past experiences of the learner as well as to his native endowments.

The significance of past experiences in meeting new situations, as well as in responding to closely similar situations, can be made clearer if reduced to specific terms. Learning to spell is usually regarded as a relatively simple process. The writer has for some years used the supervision of spelling as the first unit in his course in research as applied to the supervision of instruction because the problems of selecting, organizing, and grading the course of study, as well as the problems of learning and testing the results of learning, seem to be more simple and concrete in the case of spelling than are the corresponding problems of research in other school subjects. He has come to wonder, however, whether the problems are so simple, even relatively, as they have been assumed to be.

The discussion which follows is limited to the case of attempting to spell a word which, in so far as spelling is concerned, is a new problem to the child. It assumes that the word has neither been spelled nor read. The possible past experiences which may affect the child's responses in such a case may be grouped into five classes: (1) The study of spelling lessons which include words containing one or more of the same phonetic

elements contained in the new word; (2) Reading words which include one or more of the elements of the new word; (3) Writing compositions, letters, and examinations containing words of similar elements but not including the new word now to be spelled; (4) Speaking the word and other words containing similar phonetic elements, either in oral reading and common speech, or in pronunciation and phonic drills upon the word or words containing identical or similar phonetic elements; (5) Hearing the word or words containing identical or similar phonetic elements.

With regard to the effect of experiences in hearing and speaking, it should be pointed out that many words are ordinarily correctly pronounced but frequently misspelled. Examples are *leisure, Chautauqua,* and *beneficial.* On the other hand, many words are frequently mispronounced and because of this fact misspelled. Examples are *preliminary* and *February.* Consequently, while the correct pronunciation of a word will not insure correct spelling, it is an important aid to correct spelling.

Consider now the problem confronting the intermediate or junior high-school pupil who is called upon to spell for the first time the word *circumference.* Assume that he has heard the word, spoken it, and knows what it means, but that he has not seen it in print either in reading or in spelling lessons. What are the possible ways in which his past experiences in spelling, reading, writing, speaking, and hearing might influence the attempt to spell this word? Perhaps some clue to these possibilities may be obtained by an analysis of the ways in which the several sounds in *circumference* are written in other words.

Table I shows the variety of ways in which the various sounds can be made by utilizing letter combinations from other words containing the same or similar sounds, even when the unit of comparison is the syllable.

A mere inspection of the variety of ways in which the sounds of the syllables are made in other words shows clearly that the child's past experiences with these sounds are likely to be confusing in his attempt to spell the new word. This confusion is more sharply brought out by expressing the variety of his past experiences in terms of possible combinations. Table II shows these combinations. This table should be read: By utilizing the ways in which syllables of similar sound are spelled in other words, one finds that the sound in the syllable *cir* can be made 6 ways, *cum* 4 ways, *fer* 6 ways, *ence* 2 ways. The possible combinations are therefore 288. If one adds letter combinations from syllables in different positions in other words, syllables from less common

TABLE I

CONCEIVABLE WAYS TO WRITE THE SOUNDS OF THE SYLLABLES IN CIRCUMFERENCE

A. Similarly sounded syllables in common words

| *cir* | *cum* | *fer* | *ence* |
|---|---|---|---|
| *cer* - tain | *company* | *fern* | *appearance* |
| *cir* - cus | *come* | *referred* | *preference* |
| *sear* - ch | *circumstance* | *fir* | |
| *ser* - vice | *succumb* | *fur* | |
| *sir* | | *gopher* | |
| *sur* - ly | | *camphor* | |

B. Other positions, approximations, and less common forms

| | | | |
|---|---|---|---|
| *connoisseur* | *kumquat* | *farina* | *infants* |
| *answer* | | *pharyngeal* | *infant's* |
| | | *zephyr* | *infants'* |
| | | | *sergeants* |
| | | | *sergeant's* |
| | | | *sergeants'* |
| | | | *parents* |
| | | | *parent's* |
| | | | *parents'* |

C. Mispronunciations, wrong stresses, etc.

| | | | |
|---|---|---|---|
| *syrup* | *alchemy* | *for* | *dunce* |
| *surr* - ound | | | *runts* |
| *anniversary* | | | *varmints* |

words, and syllables having sounds less closely approximate (Group B in Table I), 3960 combinations are possible. If there are added the letter combinations from other words containing sounds which closely approximate the sounds of syllables in *circumference* in common mispronunciations and in wrong stresses (Group C in Table I), the total possible combinations are 9240. Which of these 9240 combinations is likely to prevail in the child's first attempt to spell *circumference?* Surely the probability of hitting upon the one correct spelling is very small.

TABLE II

PERMUTATIONS AND COMBINATIONS

| | *cir* | *cum* | *fer* | *ence* | *Total* |
|---|---|---|---|---|---|
| A | 6 | 4 | 6 | 2 | 288 |
| A + B | 8 | 5 | 9 | 11 | 3960 |
| A + B + C | 11 | 6 | 10 | 14 | 9240 |

Tables I and II include only such letter combinations as are found in other words having syllables identical or similar in pronunciation with the syllables with which they are matched in the word *circumference.* If, however, the sounds of these syllables are broken up so that each individual sound in the word is considered as a unit, a vastly greater number of possible combinations can be found. Tables III to VI show some of these possible combinations.

In making these lists of similar sounds, it does not seem important to make distinctions which are finer than those which would be made by most children in hearing or in pronouncing the word. Indeed, phoneti-

cians do not agree as to the accepted pronunciation of some of the words given in the tables. It is true that the *r* sound in *cir* and in *fer* is not quite that given in some of the words listed as containing analogous sounds, but the difference in these sounds would not be detected by the ordinary child. The accepted English pronunciation of *circumference* is different from the accepted American pronunciation, and there are in addition variations in the way in which cultivated Americans pronounce it. Many cultivated Americans in the East and South omit the *r* sound in the first syllable.[1]

The combined sound *cr* in *cir* and *fer* is given in the tables as a unit because of the difficulties noted above and because in one word, *colonel*, the sound is made without an *r*, while in two other words, *acre* and *iron*, the sound is made without using a separate letter to express the vowel. It must be kept in mind that the enunciation of the sound elements in a word is not the same when the word is being pronounced as a guide to spelling as when the word is spoken with the characteristic stresses found in ordinary discourse.

TABLE III

CIR

A. Similar sounds in common words

| c | ir | r if separated in *ir* |
|---|---|---|
| e - cent | ir - first | r - sir |
| s - see | er - fern | rr - marred |
| sc - scene | or - word | rrh - myrrh |
| sw - sword | ur - fur | rps - corps |
| ps - psalm | our - journey | |
| | ear - search | |
| | ere - were | |
| | ure - measure | |
| | err - err | |
| | oar - cupboard | |
| | oir - avoirdupois | |
| | eur - chauffeur | |
| | olo - colonel | |
| | ro - iron | |
| | re - acre | |

[1] The writer is indebted for advice in making these tables to Professor Henning Larsen of the Department of English of the State University of Iowa, to Dr. Milton Metfessel and Alice W. Mills of the Department of Speech of the State University of Iowa, to Dr. Sarah T. Barrows, formerly of the Department of Speech at the State University of Iowa, and to Miss Alice Coast and Miss Marjorie Kay, graduate students in education and speech. The author alone is responsible for the sounds as classified in the tables.

Although the words listed were selected after careful study of the pronunciation given in the International Dictionary, in Daniel Jones's *An English Pronouncing Dictionary*, in Palmer, Martin, and Blandford, *A Dictionary of English Pronunciation with American Variants*, and in Krapp's *The Pronunciation of Standard English in America*, it is likely that the writer's meager training in phonetics is betrayed in errors appearing in the tables. The tables are not offered, however, as an exhibit of research in phonetics but rather as an illustration of the confusing situation which confronts the child who is learning to spell.

B. Less common forms, shifts from or to initial and final positions, etc.

sch - schism
st - listen
ss - grass
sce - coalesce
z - quartz
sse - crevasse
se - pulse
ce - dance
sth - isthmus

yr - myrtle
yrrh - myrrh

rh - rhyme
wr - write

C. Mispronunciations, confusion of syllables, etc.

irr - firry
urr - hurry
orr - worry
ar - parental

## TABLE IV

### Cum

A. Similar sounds in common words

| c | u | m |
|---|---|---|
| c - cow | u - fun | m - am |
| k - king | oe - does | me - some |
| ch - chorus | o - son | mb - dumb |
| ck - check | ou - touch | mn - hymn |
| cc - account | oo - flood | mm - common |
| qu - liquor | | gm - diaphragm |
| kh - khaki | | mme - programme |

B. Less common forms, shifts from or to initial and final positions, etc.

cch - Bacchus
se - viscount
que - oblique

chm - drachm

C. Mispronunciations, confusion of syllables, etc.

lk - walk

ough - thoroughly

lm - calm

## TABLE V

### Fer

A. Similar sounds in common words

| f | er | r if separated in *er* |
|---|---|---|
| f - fun | ir - first | r - air |
| ff - off | er - fern | rr - marred |
| ph - phrase | or - word | rrh - myrrh |
| gh - rough | ur - fur | rps - corps |
| ft - often | our - journey | |
| pph - sapphire | ear - search | |
| | ere - were | |
| | err - err | |
| | oar - cupboard | |
| | oir - avoirdupois | |
| | ure - measure | |
| | eur - chauffeur | |
| | olo - colonel | |
| | ro - iron | |
| | re - acre | |

B. Less common forms, shifts from or to initial and final positions, etc.

ieu - lieutenant
lf - half

yr - myrtle
yrrh - myrrh

rh - rhyme
wr - write

C. Mispronunciations, confusion of syllables, etc.

irr - firry
urr - hurry
orr - worry
ar - parental

TABLE VI

ENCE

A. Similar sounds in common words

| e | n | c |
|---|---|---|
| a - aloud | n - new | s - yes |
| a - asylum | nn - annex | ss - grass |
| o - Europe | dn - Wednesday | sse - crevasse |
| ou - jealousy | pn - pneumonia | se - pulse |
| e - violence | gn - sign | ce - dance |
| | kn - knife | z - quartz |
| | ln - Lincoln | |
| | hn - John | |

B. Less common forms, shifts from or to initial and final positions, etc.

| | | |
|---|---|---|
| ia - parliament | mn - mnemonic | c - cent |
| oi - tortoise | | sc - scene |
| | | sw - sword |
| | | sch - schism |
| | | ps - psalm |
| | | sth - isthmus |
| | | sce - coalesce |
| | | st - listen |

C. Mispronunciations, confusion of syllables, etc.

au - authority
ough - thoroughly
i - terrible

TABLE VII

POSSIBLE WAYS OF MAKING THE SOUNDS IN CIRCUMFERENCE

| USING SPELLINGS OF IDENTICAL SOUNDS FROM WORDS KNOWN TO 6TH GRADE CHILDREN | | | | USING ALSO IDENTICAL AND SIMILAR SOUNDS FROM LESS COMMON WORDS, APPROXIMATIONS, COMMON PRONUNCIATIONS, ETC. | | |
|---|---|---|---|---|---|---|
| | (Group A) | | | | (Groups B and C) | |
| 1 | c | (s) | 5 | | 14 | |
| 2 | ir | (ər) | 15 | 75 | 21 | 294 |
| 3 | e | (k) | 7 | 525 | 11 | 3,234 |
| 4 | u | (ə) | 5 | 2,625 | 6 | 19,404 |
| 5 | m | (m) | 7 | 18,375 | 9 | 174,636 |
| 6 | f | (f) | 6 | 110,250 | 8 | 1,397,088 |
| 7 | er | (ər) | 15 | 1,653,750 | 21 | 29,338,848 |
| 8 | e | (e) | 5 | 8,268,750 | 10 | 293,388,480 |
| 9 | n | (n) | 8 | 66,150,000 | 9 | 2,640,496,320 |
| 10 | e | (s) | 6 | 396,900,000 | 14 | 36,966,948,480 |
| | r separate in sounds *ir* and *er* | | | 4,064,256,000 | | 977,738,065,920 |

You will note that, as in Table I, Group A represents sounds in words with which a junior high-school student is likely to have had experience and which are identical or very similar to the corresponding sounds in *circumference;* Group B includes identical or similar sounds in words which are either less frequently found or contain the sound in a position other than the initial or final one; Group C includes sounds arising from mispronunciations and wrong stresses, which, because of these shortcomings, duplicate or approximate corresponding sounds in *circumference.* Analogies from the spelling of possessive forms are omitted from Tables III, IV, V, and VI, although included in Table I. Were

these combinations added to those of Table VI, the number of combinations would be correspondingly increased. The tables are prepared on the basis of the pronunciation sēr kūm fēr ēns (Webster's New International). Were one to use other pronunciations which are acceptable in cultivated speech, the tables would be changed accordingly. It must be kept in mind that the possible combinations which the student actually may make are by no means limited to such as are shown in Tables III to VI inclusive, since some mispronunciations are so far afield that many other letter combinations are possible.

Treating now the various combinations of Tables III to VI after the manner of Table II, the data of Table VII result. This table should be read, beginning at the left-hand side and reading downward, as follows: The initial sound of *circumference* (s) is written in common words in 5 ways, the sound *ir* (ēr) in 15 ways. The total possible combinations of spellings of these two sounds is therefore 75, etc. The total possible combinations, using spellings of identical and similar sounds from words likely to be known to a sixth grade child are 396,900,000. If the *r* be thought of as separate in the combinations *ir* (ēr) and *er* (ēr) (except in *colonel*, *acre*, and *iron*), the total possible sounds are 4,064,256,000.

Reading now down the right-hand side, using also identical and similar sounds from less common words and approximations (Groups B and C in addition to Group A in Tables III to VI), the initial sound in *circumference* (s) can be made 14 ways, the sound *ir* (ēr) 21 ways, making a total of 294, etc. Using the sounds from Groups A, B, and C, the total possible sounds are 36,966,948,480. If (except in *colonel*, *acre*, and *iron*) the *r* be regarded as a separate sound in *ir* (ēr) and *er* (ēr), the total number of possible combinations would be 977,738,065,920.

But, you are probably asking, are these possibilities not merely theoretical? Even using the conservative figures which result when analogous sounds are taken from very common words and when the *r* is not separated from the vowel in *cir* and *fer*, are there 396,900,000 possible ways in which the child's past experience might possibly take shape in his attempts to spell *circumference* for the first time? Whether or not this number of combinations is even theoretically possible depends upon what may be called the freedom of any given element to associate itself with each and every other element. For example, having used for the initial sound (s) *sw*, is this symbol limited in its associations, or is it "free" to form an association with any of the letter combinations listed under *ir;* as for example, *swir, swear, swor?* Likewise, when one of

these associations has been made, is this new combination then "free" to associate itself with any other element listed in these tables? It seems likely that the possible combinations here listed must be regarded as the maximum number of possible combinations, assuming that there are listed in these tables all of the possible spellings of identical and similar sounds. There may indeed be possibilities other than those here listed. Those represented in the tables are all that the writer and two graduate assistants discovered in a good many hours of careful search. Very likely there are limitations upon the freedom of one element to associate itself with all other elements. In other words, these elements are not entirely independent. For example, it may not even be theoretically possible to spell circumference, psolokhoegmpphouriadnz. The elements most likely to be limited are those involved in making the initial and final *s* sound. Certainly the spellings given in Tables III to VI cannot be thought of as being freely associated, in the ordinary statistical sense, in the mind of a child. For even if it be assumed that all of these spellings have been seen or written, it is certain that such factors as number of repetitions, vividness, and recency must be taken into account. On the other hand, actual samplings of spellings show that the child is much more "free" than has been suspected in spelling unknown words. In fact, he is "free" to use combinations not here given. The way in which the various elements of the child's experience may operate in actual spellings will be shown in a subsequent article.

Which combinations would actually result in, say, a thousand billion attempts at spelling? Unfortunately, it is impossible to tell this since there are not enough English-speaking children to serve as subjects for an experiment even if it were possible to tabulate the billions of spellings necessary to test out the theory. Probably the number of combinations which would actually occur even in a thousand billion spellings is much less than is indicated in Table VII. On the other hand, the number of different spellings which would occur even in a million attempts would undoubtedly be very large, assuming that the children attempting the spellings had not seen the word.

The hypothesis under which these possible spellings were listed was that the word had not been seen by the children doing the spelling. A single experience in writing, or even seeing, the word undoubtedly limits the probable variety of attempted spellings enormously. Moreover, it seems probable that an experience even with the larger units within the word limits the variety of attempts. For example, the child who has

seen or knows how to spell *circumstance, circumscribe,* or *circumnavigate* would probably thereby be more likely to approximate the correct spelling of the first two syllables of *circumference.* In a similar way the child who has seen *transference, conference,* or *inference* would probably be influenced to limit his attempts in spelling the base of the word. Fortunately, children are not often asked to spell words they have never seen, and even when this occurs, the wise child will either consult the dictionary or other sources of aid.

The tables bring out forcibly the seriousness of the unphonetic character of the English language, both from the standpoint of spelling and from the standpoint of reading. It is no wonder that a few months after a word has been temporarily learned in a spelling lesson, and subsequently used only occasionally in writing, the child is sometimes confused by the conflicting elements which his pronunciation of the word may call out of his past experience. With so little of a rational character to guide him the wonder is that the child fixes as easily as he does upon the one arbitrary combination which constitutes the correct spelling.

The writer recently read a Doctor's thesis in which the investigator naïvely assumed that in spelling new words the child's past spelling experiences operate positively. The data from the preceding tables show why such a statement is most unlikely to be true, and direct experimental evidence shows that such experiences in spelling may operate negatively as well as positively.

No doubt the reader is now asking: Is there no way to bring some order out of this apparent confusion? Studies already completed, or under way, indicate that something may be done in the way of the rationalization of spelling, although the possibilities are definitely limited. Research has already been completed to show what elements in spelling are rational. These can be made the basis of generalization, and the results of such generalization measured experimentally. This seems to be about all that can be hoped for at the present time. To teach simplified spelling or the habitual use of a phonetic alphabet involves difficulties which at present seem insurmountable as far as public schools are concerned. If schools will acquaint students with past and present attempts to make spelling more rational, something may be accomplished through the gradual building of a public opinion which will welcome needed changes. The history of attempts to simplify and rationalize our spelling suggests that such changes will be made very slowly indeed.

# EDITORIALS

## RESEARCH

The experimental study of education is passing out of the play, manipulative, or exploratory stage. Better acquaintance with experimental methods should bring better research. It seems that there are a number of practices found in reports of careful research workers that should enjoy more general acceptance. Too much investigating of the superficial type is likely to work a permanent injury to the cause of research. It will be the purpose of this editorial to point to a few of the more obvious practices of careful research workers that need wider application.

1. It would seem that research workers could facilitate the understanding of reports of research work by exercising more care in the statement of the problem under investigation. A good, clear, straightforward statement of the problem with some further analysis of it into its elements should ordinarily be of great assistance to the reader. Some writers follow the practice of stating the problem at the very outsta of the report with little or no preliminary inferences from the discussion. This seems to be effective.

2. Often research workers should exercise more care in explaining, describing or defining whatever is to be studied. Some one, for example, sets up an experimental study of the traditional and the unit-contract methods of teaching with little or no definition of either method. There are, however, many variations in both the traditional and the unit-contract methods of teaching each with a different degree of effectiveness. In the absence of objective definitions of the procedures to be compared the results are of doubtful value.

3. It would seem that more attention should be given to the validity, reliability, and objectivity of data gathering devices; tests, interviews, questionnaires, observations, etc. We have come to expect that tests have validity, reliability, and objectivity; other data gathering devices should likewise possess these qualities. An investigator wishes, for example, to study the development of social concepts in school children. What is a social concept? When can a child be said to possess a certain social concept? Does the procedure used in the investigation actually ascertain whether the child possesses the concept? Has the procedure reliability and objectivity? It would seem that if our researches are to mean anything that the devices used in gathering data should be carefully evaluated from validity, reliability and objectivity.

4. More confidence in the results would follow more attention to the adequacy of samples. Not only should the reliability of statistical quantities such as averages, measures of dispersion and measures of relationship be determined by appropriate sampling formulas, but the

representativeness of the materials used in the investigations should be ascertained. Every educational investigation involves these two aspects of sampling. A recent study of number concepts is based upon 300 cases selected from a single school system. Would 300 cases selected from five school systems have been better? Or should there have been many more cases from many more school systems? The sample used in a given investigation is the foundation of the experimental structure later constructed upon it and this structure is no better than its foundations.

5. The isolation and control of all factors which are involved is essential to accurate methods. In educational research we should cultivate sensitiveness to all factors that may effect the outcome of the experiment. Certainly the more exact methods of determining which factors are important and need to be controlled should be utilized. The selection of the factors to be controlled should not be merely a matter of personal preference. They need to be experimentally determined. Finally extreme care should be exercised in the control of factors if our experimentation is to mean anything.

6. There is a tendency with many research workers to put too much faith in the equivalent group method of experimentation. Groups and individuals are ordinarily equivalent only in a very general sense. It would seem that more attention should be given to establishing the equivalency of groups. The administering of a few achievement and intelligence tests is ordinarily not a sufficiently exact method of equating groups to produce highly reliable results. In many instances, the single and rotated group methods may be used to advantage.

7. There is evidence that many research workers fail to apply some of the simpler statistical procedures. In discussions of the significance of gains and differences found in experimental studies, for example, there was a time when it seemed perfectly all right to look at a given gain or difference and subjectively ascribe to it great importance or no importance. Careful workers today, however, express the significance of gains and differences statistically. This example is merely an illustration of a number of simpler statistical procedures that might be profitably used in experimental work.

8. Honesty to the reader requires that great care should be exercised in the drawing of generalizations from experimental data. One fact, for example, frequently overlooked is that such results as are secured from experimental investigations are limited by the tests and measures used. It is too often said that the data show method X to be superior to method Y. What is really meant is that method X is superior to method Y in the thing measured by test Z. There may be a vast difference in these two statements. Similarly the age, grade, and intelligence of the pupils studied constitute important limitations upon the generalizations that may be drawn from educational data.

The points here made are not new. They are merely those found in the reports of careful research workers. They seem, however, to illustrate the simpler types of procedures that research workers should follow.

A. S. B.

# REVIEWS

Address all communications relative to book reviews to Editor E. J. Ashbaugh, Ohio State University, Columbus, Ohio.

ROBERTS, A. C. AND DRAPER, E. M. *Extra-Class and Intra-Mural Activities in High Schools.* New York: D. C. Heath & Co., 1928, xvii + 529 pp.

For several years two or more books have been added annually to the professional literature that is concerned with the social experience of children in school. The latest volume of which Roberts and Draper are the authors, is a comprehensive work on the subject but it differs from most of the other books in several important particulars.

In the first place, the authors have made an earnest attempt to orient the minds of their readers by formulating a philosophy of education. The nature of the work is suggested in a general way by the titles of the first two chapters which are "Democratic Ideals in American Secondary Education" and the "Contribution of Extra Curricular Activities to the Realization of Democratic Ideals." The principles that are set forth are based on fundamental historical, sociological, and psychological concepts. The emphasis of the authors on the necessity of a sound intellectual point of view on the part of practical workers in the field is exceedingly well taken. This aspect of the subject has been greatly neglected by other writers. In view of these facts it is to be regretted that the authors did not make greater use of books on politics, sociology, and psychology which throw much light on the value and objectives of student organizations, and include a large number of such references in their bibliographies on these chapters, (pages 499-502).

A second prominent feature of the book is the presentation in practically every chapter of a large amount of descriptive material concerning concrete practices. This material was taken from answers to questionnaire by the principals of approximately 100 superior schools and from printed and mimeographed matter which was sent in from these schools. In the treatment of this material the authors have not been concerned as much with logical analysis and refined tabulation as with direct description or quotation of the things that progressive principals and teachers are doing in the management of student councils, honor societies, assemblies, newspapers, athletic groups, orchestras, clubs of various kinds, etc. For this reason the book will be especially helpful to teachers and principals in service.

The inclusion of four chapters on administrative problems is a third distinctive feature of the book. These chapters deal with general supervisory problems, with school credit, faculty participation in the program, and with the administration of finances. Principals will find much helpful guidance and many practical suggestions in the pages of these chapters.

Six chapters are devoted to various types of clubs. No other general work in this field presents as large an amount of material on this very important part of the program of activities. There is also

a chapter on activities in elementary schools, an aspect of the subject which has been given but little attention hitherto in general books on this part of the school's work. At the end of the book a list of references is given for each of the chapters, which, the authors frankly state, (page 500) are intended as an introduction to the literature for the field rather than for the needs of advanced or research students.

Every page of the volume bears witness to the practical experience of the authors as high-school principals, and expresses great enthusiasm and strong convictions as to the importance of organized student life in a sound program of education for citizenship in a democracy.

PAUL W. TERRY

*University of Alabama*

THWING, CHARLES FRANKLIN. *The American and the German University*. New York: The Macmillan Company, 1928, 238 pp.

Out of his wealth of training, contacts and experience, President Thwing gives us another volume of interest and worth. He traces rapidly and skillfully the development of the influence of the German Universities over higher education in this country from the first students who enrolled at the University of Göttingen to the present time and shows why these students tended to go to Germany rather than to France or to England. He likewise points out the influence on our own universities of German professors with their ideals of academic freedom, thoroughness and productiveness.

He notes the decline of the migration of American students to German universities during the last two decades and interprets the cause not solely because of the war but because of the development at home of opportunities which were not formerly available.

The volume is charmingly written and may be read with interest and profit by anyone who is interested in higher education but who has not kept closely in touch with this phase of international relations.

E. J. ASHBAUGH

*Ohio State University*

WATSON, GOODWIN B. *Experimentation and Measurement in Religious Education*. New York: Association Press, 1927. xii +295 pp.

As indicated in the introduction, the volume is intended as a brief manual of experimental method "for students in undergraduate and graduate courses in religious education who are anxious to secure a more adequate understanding of the experimental viewpoint and the necessary techniques." Accordingly such subjects as: choice of experimental method, methods of measurement, construction of tests, statistical methods and presentation of the results of experimentation, have been treated in some detail. The chief contribution made by the author in his treatment of these topics is in the many and varied applications to religious education. The average religious educator is apt to regard experimentation and measurement as having little, if any, application to religion. The abundant illustrations drawn from this field, however, should go far to win the religious worker's interest and support of experimentation as vital to progress in religious education. Not the least convincing as to the need for experimentation in this field is the list of one hundred and forty pertinent problems in religious education suggested by the author for experimental investigation.

Probably the chapter of greatest interest to the average religious educator is the one giving brief descriptions of tests for use in this field. Here we find some seventy tests listed in three general groups: (1) Tests now available in printed form; (2) Tests containing valuable ideas but not now available; and (3) Life situation, conduct, and behavior tests. Since the majority of religious workers have had little or no acquaintance with objective tests, this chapter furnishes not only an excellent introduction to them, but sufficient information concerning these tests to assist the worker in the choice of a test for his own use. However, one does not gather from these brief descriptions an adequate idea of the difficulty involved in actually administering these tests according to directions.

This volume is a much needed contribution to the field of religious education. Bringing together, as it does, in one volume "materials previously scattered through periodicals and dozens of books" it enhances greatly the possibility of a larger group of religious educators becoming not only interested but trained in the experimental method.

WHITTIER L. HANSON
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REEVES, CHARLES E. AND GANDERS, HARRY S. *School Building Management*. New York: Teachers College, Columbia University, 1928. xiii + 395 pp.

The purpose of this volume as expressed in the preface is "to aid both school administrators who have charge of public school buildings, and janitor-engineers who are responsible for their management to secure and perform more adequate janitorial-engineering service." The volume discusses the four following phases of school building management: (1) Personnel and Management of School Janitorial-Engineering Service; (2) Efficiency and Economy in the Cleaning of School Buildings; (3) Efficiency and Economy in the Heating and Ventilating of School Buildings; and (4) Efficiency and Economy in the Special Work of School Building Management.

Under the first of these major subdivisions, suggested qualifications for janitor-engineers are given. These qualifications are divided into two groups, namely, minimum requirements and desirable qualifications, which should be given considerable weight in the selection of the personnel. Considerable data are also presented in this first section on the salaries for this type of service in various sections of the United States. Another problem for which there is definite need of unified procedure is that of the load which a janitor-engineer may normally be expected to carry. The very wide variation in conditions under which the operation and maintenance functions are performed makes it exceedingly difficult to establish any very definite criteria for determining the proper load for a janitor-engineer. In this connection, however, the authors have set up twenty-two factors which should be given consideration in the determination of the cost of janitorial service. A salary schedule based on experience, training, merit, and degree of responsibility is also suggested.

The chapter headings of Part II are indicative of the material contained therein. These are (1) the cleaning of classroom floors by vacuum, (2) uses and installation of central vacuum cleaners, (3) sweeping, (4) scrubbing and mopping, (5) the preservation of floors, woodwork, and furniture, (6) dusting, (7) the care of the toilet rooms, (8) cleaning of glass, (9) blackboard and eraser clean-

ing, (10) miscellaneous cleaning jobs. Each of these subheadings are discussed in considerable detail. In fact, some are of such detailed nature that they would seem to have little practical value so far as the ordinary janitor-engineer is concerned. For example, data are presented on the amount of time required in washing windows of a given size under three conditions, namely, rubbing up and down, back and forth, or circular.

In the third section, detailed information on different systems of heating and ventilating and their operation is presented. In view of the large number of janitors who have little familiarity with the complex machinery necessary in modern heating and ventilating, this section should be especially helpful. As a matter of fact, one of the most common difficulties in the operation of a school plant relates to the heating and ventilating.

The fourth section deals with safety engineering, records and reports, the care of school grounds, and various types of repair work. A rather complete list of kinds of repairs which a janitor-engineer is expected to make together with a suggested list of repairs or replacement jobs which might be done sometime during the year are presented in this section. In the matter of records and reports, it was found that in 204 systems examined, the janitor-engineers in only 111 were required to make reports of any kind.

It was found that the normal education of janitors ranges from no schooling to college education with the average janitor having an eighth-grade education. Since the volume has been prepared primarily for janitor-engineers the authors have had the problem of preparing it on that educational level. In this respect the authors have well succeeded.

The volume presents a very large amount of useful information on various aspects of school building management which should prove especially helpful to school administrators in smaller systems, superintendents of buildings and grounds in larger systems, and the janitor-engineers in systems of all sizes. In those cities such as St. Louis and Minneapolis where the janitor-engineers meet regularly for instruction, this volume should serve as an excellent basis for study and discussion. On the whole the authors have made a worth while contribution to a phase of public school administration that has too long been neglected.

T. C. Holy

*Ohio State University*

Tiegs, Earnest Walter. *An Evaluation of Some Techniques of Teacher Selection.* Bloomington, Illinois: Public School Publishing Company, 1928. x + 108 pp.

Techniques of teacher selection depend considerably on faith. Each year certain new teachers are selected in city school systems while numerous other candidates are passed by. Whether teachers are chosen on "hunches," or after careful scrutiny of numerous rating sheets and other documentary evidence, it is with the hope they are the best available. Whether those eliminated would have done better than those selected is not easily determinable. A noteworthy approach to this problem made in the Minneapolis schools, has been recently completed.

In 1925, when he was assistant to Superintendent Webster, Dr. Tiegs secured from eleven judges prediction rankings of 25 elementary teachers newly elected. These rankings were based upon recommendations, photographs, and letters of application. He used as a criterion of comparison the rankings of

the 25 teachers made by principals and supervisors at the end of the first year of service in Minneapolis. In 1926 he made a similar study of the rankings of 50 teachers new to the schools that year, using this time an extended graphic rating sheet instead of the customary "word" form. In each case re-ratings were made by the same judges on the same teachers. Some of these correlations follow:

| | | |
|---|---|---|
| 1. | Recommendations (11 judges) with criterion . . . | + .08 |
| 2. | Composite (adding ranks) of recommendations, letters of application, and photographs with criterion (5 judges each) . . . . . | — .13 |
| 3. | Complete file with criterion | + .27 |
| 4. | Second ranking of recommendations with criterion (5 judges) . . . . . | + .30 |
| 5. | Intercorrelations between 5 judges on recommendations | —.37 to +.78 |
| 6. | Coefficient of reliability between first and second rankings of recommendations . . . . . | .00 to +.37 |
| 7. | Correlation between ratings of 21 principals and 2 supervisors on 12-point graphic rating blanks (25 teachers) . . . . . | + .70 ± .07 |
| 8. | Correlation between predictions (12-point blank) and criterion (50 teachers) . . . . . | — .21 ± .08 |
| 9. | Reliability of 41-point rating blank (75 judges) . . . | + .93 ± .01 |
| 10. | Correlation between results of trade tests (Knight, Ruch, Telford, Bathurst) and criterion, (80 teachers) . . . . . | + .02 ± .08 |

Two things are evident from this study. First, that with the 41-point scale, supervisors agreed substantially in ranking their own teachers at the end of the first year. Second, that with the present techniques of teacher selection, it is impossible to predict rank order success among those new teachers selected in a city system. Since no significant ranking of the 25 and 50 teachers selected in the years 1925 and 1926 respectively was attainable, it is likely that among the "runners up" for teaching positions during those years there were a number who would have been ranked higher by supervisory officers than were some of those hired.

Dr. Tiegs has done a thorough piece of work. His study leaves the reader keenly aware of innumerable unsolved problems in the way of effective selection of teachers. He says,

> "....evaluating teaching success has consisted of taking a somewhat arbitrary list of factors, rather general in nature, and undefined either in general terms or in terms of the varying degrees in which evidence of them might be expected to manifest itself, and then guessing at what the answer should be. Under these conditions it is natural that school officials with their varied personal equipment, training, objectives, attitudes, and professional environment, should agree neither on the facts of a particular case nor on the significance of such facts in relation to teaching success."

This study will be of especial value to those engaged directly in the training, placement, and selection of teachers, many of whom are giving much weight to techniques and factors found by Tiegs to be of little value in teacher selection.

EARL W. ANDERSON
*Ohio State University*

STULL, DEFOREST. *Tentative Course of Study in Geography for the Primary Grades, Intermediate Grades, Junior High School.* New York, Teachers College, Columbia University, 1927. viii + 288 pp.

This course has been prepared as the result of three years of coöperative effort by the faculty of the Horace Mann School of Teachers College and covers the geography work in Grades III to IX inclusive. It follows the one-cycle plan

in treating the continents, but rounds out the necessarily incomplete treatment of the United States in Grade V by offering a second and more detailed treatment four years later. The plan of studying each continent or country but once will no doubt work well in schools where the pupil mortality is small. The order of study of the continents—Africa and Australia immediately after South America—has good reasons to support it.

In the third grade the observational method is followed, while in the fourth grade the chief reliance is on imaginary journeys to the parts of the earth studied. In Grades V-VIII the problem method is the main basis of instruction, while in the ninth grade the work is largely topical. The reasons for the emphasis on topical study at this point are not stated.

Throughout this course many correlations of geography with history are provided and, to a lesser extent, with civics. If such unification of social studies is to prevail it is the wish of geography teachers that they have a voice in the merger of subjects, as in the present instance.

The course is a teachers' manual as well as an outline of prescribed subject-matter, and the greater part of its three hundred pages is devoted to methods, to professionalized subject-matter, and to illustrate examples of teaching units in each grade. It is a valuable addition to curriculum literature and should have a wide use among geography supervisors and teachers. The professional schools for teachers have been contributing too few projects of this kind. Most of the widely known geography courses have been written by staff members of public-school systems. It is therefore timely to have such a course made and published by a professional school.

GRANT E. FINCH
*State Normal School,*
*Danbury, Connecticut*

WHIPPLE, HELEN DAVIS. *Making Citizens of the Mentally Limited.* Bloomington, Illinois, Public School Publishing Company, 1927. vi + 374 pp.

This is an excellent manual for teachers of special classes for subnormal, mentally deficient, and retarded pupils and a suitable textbook for teachers in training. Mrs. Whipple's statement of general principles and her treatment of concrete material are both excellent. The book is practical and contains enough examples of detailed specific procedures to be helpful to even the unimaginative teacher.

The information on what to get in the way of equipment and how to use it is good, though omission of estimates of cost or how to spend the first five hundred dollars might confuse the inexperienced teacher. The titles in the bibliographies are carefully chosen, both those for pupils who can read and those for the teacher herself.

The special-class teacher is a pioneer in the differentiation of elementary curricula. The emphasis which the special class has placed an adaptation of school work to the true educational needs of individual children is gradually leading the way for the reformation of the elementary curriculum which still remains uniform for all children in too many school districts. This uniformity exists in spite of our present knowledge of the wide variation in capacities and intellectual maturity of the so-called "normal" children. Because of this uniformity the gifted child has probably suffered most. Books like this should encourage the special-class teacher to feel that she cannot only do worth-while work with her handicapped group but that she is making a real contribution to the solution of the problems created by the present uniform elementary curriculum.

FRANCIS N. MAXFIELD
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# RESEARCH ABSTRACTS and BIBLIOGRAPHIES

Address all communications relative to research abstracts and bibliographies to Editor A. S. Barr, University of Wisconsin, Madison, Wisconsin.

HUDELSON EARL. *Class Size at the College Level.* Minneapolis: The University of Minnesota Press, 1928.

A report of experimental studies of class size fostered by the University of Minnesota Committee on Educational Research. The monograph contains the following discussions: the problem and its significance; review of investigations of class size; trends in adjustment to increased class size; the class size situation at Minnesota; student testimony; faculty testimony; experimental evidence; class size and techniques of instruction; observed evidence; class size and instructional costs; conclusions; bibliography and appendixes. The volume is the outcome of a series of carefully conducted experiments upon this subject. The author concludes that:

"In the light of all available evidence, class size seems to be a relatively minor factor in educational efficiency, measured in terms of student achievement. What the major factors are we do not know; to be determined they must be isolated, controlled, and tested one at a time. Nor do we know whether there are important educational outcomes other than achievement accruing, or at least accruable, only from small classes, or whether experiments by other instructors using the same or different teaching methods in the same or other departments or courses would produce similar results. All that can be said is that in the courses investigated, the effect of class size upon student achievement is, in the opinion of the sub-committee, too slight to warrant the cost of small classes."

KNIGHT, FREDERIC B. AND BEHRENS, MINNIE S. *The Learning of the 100 Addition Combinations and the 100 Subtraction Combinations.* New York: Longmans, Green & Company, 1928.

The study reports data concerning the learning and remembering of the 100 primary addition combinations and the 100 primary subtraction combinations. The monograph attempts to supply data not merely about the relative difficulty of number combinations, but to indicate how much practice each combination seems to require.

Chapter I describes an investigation in which the number of practices together with the time consumed by a group of second-grade children in the learning of the 100 addition and the 100 subtraction facts is given.

Chapter II reports the difficulty ratings for the 100 addition facts and certain other data such as the amounts of practice needed to master them.

Chapter III presents the difficulty rankings of the 100 subtraction facts.

Chapters IV and V contain a comparison of the ratings given in this monograph with those offered by Clapp.

Chapter VI suggests uses of the data reported in this investigation.

RUGG, EARLE U. *Curriculum Studies in the Social Sciences and Citizenship.* Colorado Teachers College Education Series, No. 3 Greeley, Colorado: Colorado State Teachers College, 1928.

The author attempts to answer the following questions: (1) To what extent does the present social science curriculum meet the social needs of secondary school pupils? (2) To what extent does it meet learning needs? and (3) To what extent does it provide for relative values? The writer has made a detailed analysis of the social science textbooks in common use in secondary schools. From these analyses he believes that he can set forth rather definitely the essential characteristics of what pupils are now taught. By using the semi-scientific studies in the field of the social sciences as criteria an attempt is made to evaluate the present secondary social science-citizenship curriculum.

RUGG, EARLE U. AND DEARBORN, NED H., *The Social Studies in Teachers Colleges and Normal Schools,* Colorado Teachers College Education Series, No. 4, Greeley, Colorado: Colorado State Teachers College, 1928.

A study carried out under the Division of Education of the Commonwealth Fund. The monograph contains the following materials: the general teacher-training problem; general provision for the social studies in teachers colleges and normal schools; the subject matter courses in the social studies in teachers colleges and normal schools; methods courses in the social studies in teachers colleges and normal schools; special phases and problems of preparing teachers of the social studies; the social studies in public schools; and the relationship between the professional preparation of the teachers of the social studies in teachers colleges and normal schools and the social studies in public schools.

SHANNON, JOHN RAYMOND. *Personal and Social Traits Requisite for High Grade Teaching in Secondary Schools,* Terre Haute, Indiana: State Normal Press, 1928.

The study attempts to determine the personal and social traits requisite for high-grade teaching in secondary schools. The data are based upon personal interviews with supervisors; students' estimates of teachers; analysis of rating scales; analysis of recommendations and recommendation blanks; studies of why teachers fail; traits considered in state certification plans, state tenure laws; contracts, etc., codes of professional ethics for teachers; questionnaires to critic teachers; and minor investigations. The author offers the following summary of his findings:

"In light of the procedures followed and the techniques used in developing them, certain conclusions seem warranted. These conclusions, like the conclusions of all investigations that aim to be sincere or scientific, are not offered as final. Further investigations may bring modifications, and when such come no one will be more ready to receive more light than the writer.

"1. The primary traits that have most to do in influencing success in teaching in secondary schools are SYMPATHY, JUDGMENT, SELF-CONTROL, ENTHUSIASM, STIMULATIVE POWER, and EARNESTNESS.

"2. A secondary list of important traits consists of AFFABILITY, INDUSTRIOUSNESS, VOICE, ADAPTABILITY, FORCEFULNESS, CO-OPERATIVENESS, ATTENTIVENESS TO OWN USE OF ENGLISH,

ACCURACY, ALERTNESS, INTEGRITY, and RELIABLENESS.

"3. The six primary traits will take care of eighty percent of all the attention that needs to be given to traits of high-school teachers.

"4. Some traits, such as HEALTH and INTELLIGENCE, for example, are highly desirable, but there is a high probability that most teachers possess these traits. For this reason they do not fall in the primary or secondary lists.

"5. Failing teachers are better subjects for trait study than are successful teachers.

"6. The analysis of rating scales is the most typical study. That is, it has higher correlations with the others. The study in questionnaires to critic teachers is second, and the study of why teachers fail is third. The study of the hundred best and hundred worst teachers and the study of certification and tenure laws have the lowest correlations with the others. The primary traits stand at the top of the array found by the study of why teachers fail better than they do in any other. For this reason it may be said to be the most typical."

WILEY, GEORGE M. AND VAN COTT, HARRISON H. *The Junior High School in New York State*, Albany, New York: The University of the State of New York, 1928.

A study of present practices in the organization and administration of junior high schools in the state of New York. The materials are organized around the following topics: the purpose of the junior high school; organization and administration; the program of studies; supervision of instruction; guidance; the organization of instruction; practical arts; the extracurricular program; character development; and general suggestions for organizing and administering junior high schools. The bulletin also contains an annotated bibliography.

## EXPERIMENTAL STUDIES REPORTED IN CURRENT ISSUES OF OTHER MAGAZINES

### EDUCATIONAL ADMINISTRATION AND SUPERVISION

COOK, INEZ M. AND GOODRICH, T. V. "How High School Pupils Spend Their Time," *The School Review*, XXXVI (December, 1928), 771-778.

A study of how one thousand sophomores, juniors, and seniors in the Lincoln High School, Lincoln, Nebraska, spend their time. The authors conclude that:

"1. The attitude of the average teacher toward pupils is reasonable and sympathetic, as shown by the generous provision in the recommended daily schedule for recreational and social activities sponsored by the school and for wholesome activities outside the school.

"2. The variation in the amount of time teachers think pupils ought to devote to most activities is nearly as great as the variation in the amount of time the pupils actually devote to these activities.

"3. While the pupil averages for nearly all the items are not far from the averages of the teachers' expectations, there are a few pupils at both ends of the distribution who need individual adjustment.

"4. As to home study, this investigation would indicate that no general reform is needed. On the other hand, however, a small percentage of pupils

are doing little or no home study, while, on the other hand, a small percentage of pupils are doing an excessive amount. The problem appears to be one of individual adjustment, not one of group adjustment.

"5. It may be possible to make the worth-while activities in which pupils voluntarily engage contribute more to the aims of education. It may be that to increase school influence in that field would be more worth while than to secure more time for formal study at the expense of curtailing those activities."

PSYCHOLOGY OF LEARNING

FITZGERALD, JAMES A. AND LUDEMAN, W. W. "Sex Differences in History Ability," *Peabody Journal of Education*, VI (November, 1928), 175-181.

A study of 208 students in the sixth, seventh, and eighth grades in rural schools, city schools and the training school of the Southern State Teachers College, South Dakota. The author concludes that:

1. The boys of the sixth and seventh grades seem to know more history than the girls, but in the eighth grade the girls are superior to the boys. The reason may be that history interests boys earlier, and that boys learn it easier and sooner and do not strive so hard to review or retain it as girls do.

2. It seems that while girls learn more history, both fact and reasoning, in proceeding from the sixth to the eighth grade than do boys, boys are perhaps comparatively better reasoners when the facts known are considered as a basis for comparison.

3. There is in general a rough correlation between fact ability and reasoning ability. In other words, students who have high scores in fact history were usually good in reasoning history. The reverse was also true. Poor reasoning ability and a low score in facts went hand in hand.

4. Training-school and city-school boys and girls seemed to know more history than did rural children, owing perhaps to better equipment, library facilities, and a greater amount of time devoted to history teaching.

EXPERIMENTAL STUDIES OF TEACHING

LEWERENZ, ALFRED S. "The Educational Effect of Coloring Stereopticon Slides," *Educational Research Bulletin*, Los Angeles City Schools, VIII (October, 1928), 8-13.

The purpose of this experiment was to discover what differences exist in the ability of children to gain worth while information from plain lantern slides as compared with colored lantern slides. Two sets of slides were used with ten views in each. Both sets were identical except that one was colored. A true-false test of twenty questions was developed for each set of slides. The experiment was tried in seven elementary schools in the city of Los Angeles. The author draws the following conclusions:

"The statements given below were found true for the pupils, slides, questions, and items included in this study. Experience only can show whether or not the following conclusions may have a more general application.

"1. Considering the average amount of information gained from the two types of slides, the plain slides had a marked advantage over those that had been colored. Expressed in terms of percent, colored slides did about 88 percent as well as did the plain slides.

"2. Graphs indicate that the distribution of scores for plain slides

approaches more nearly a normal curve than do those for the colored slides.

"3. The graphs reveal that about 14 percent of the pupils did not do as well on the test questions after seeing the slides, plain or colored, as they did on the pretest. It would seem that screen pictures are not always a help to students.

"4. An average gain of less than two questions between the two tests indicates that showing slides without explanation brings no marked increase of knowledge.

"5. Children show a two to one preference for the slides that have been tinted. Of the 536 pupils voting, 29 percent made plain slides their choice while 71 percent liked colored slides best.

"6. Interest of content is an important factor in causing popularity. One plain slide was more popular than eight of the ten colored slides.

"7. Color does not always attract since two tinted slides were not as well liked as the plain slides.

"8. The appeal created by color is not a fixed quantity but varies from a positive decrease in effect through no change and up to a very definite increase.

"9. Color, under certain conditions, seems to make more palatable to the eye pictures which lack inherent interest.

"10. Results for the popularity of plain slides probably give a fair estimate of their inherent interest value.

"11. Two homogeneous groups of pupils respond in almost exactly the same manner to visual stimuli.

"12. Correlations indicate that information gained from colored slides does not correspond as closely to first knowledge as does the information from plain slides. This conclusion agrees with the finding in item two above.

"13. A use of color would seem to be the amplification of concepts regarding certain subject matter."

### APTITUDE TESTING AND PREDICTING SCHOOL SUCCESS

KAULFERS, WALTER, "The Prognostic Value of General Language," *School and Society*, XXVIII (November 24, 1928), 662-664.

The data are for 186 pupils in the Woodrow Wilson Junior High School, San Diego, California. "The correlations indicate that teachers' marks in general language are no more certain predictive measures for foreign language than ordinary intelligence quotients, and appreciably less accurate than simple grades in English. Thus the general language work can scarcely be justified on its exploratory guidance merits. Indeed, the very theory of the course, in so far as it assumes the existence of a so-called "language talent" or "linguistic aptitude," seems in the light of recent investigations, to rest upon an exceedingly precarious foundation. It is partly for these reasons and partly because the course did not yield generally satisfactory results, even after a fair trial of more than two years under very favorable conditions, that the work was recently discontinued in the Woodrow Wilson Junior High School and

throughout the city schools of San Diego.

LANGLIE, T. A. "A Comparison of Aptitude and Training Tests for Prognosis," *The Journal of Educational Psychology*, XIX, (December, 1928), 658-665.

The study is an analysis of the results obtained by giving the Iowa Placement Examinations in English, mathematics, and chemistry to some three hundred freshmen in the College of Engineering at the University of Minnesota. The training or achievement tests consistently proved to be better instruments for predicting future achievement than aptitude tests.

ZAUT, JAMES H. "Predicting Success in Practice Teaching," *Educational Administration and Supervision*, XIV (December, 1928), 664-670.

A study of two hundred students from the classes of 1923, 1924, 1925, 1926, and 1927 of the Southeastern State Teachers College, Durant, Oklahoma. Marks in educational psychology and in education and methods courses were not good indication of success in practice teaching.

EDUCATIONAL TESTS AND MEASUREMENTS

HUFFAKER, C. L. AND DOUGLASS, HARL R. "On the Standard Error of the Mean Due to Sampling and to Measurement," *The Journal of Educational Psychology*, XIX, (December, 1928), 643-649.

The authors point out that there are three formulas for the standard error of the mean which necessitates careful thinking as to which should be employed in any given instance.

WALKER, HELEN M. "A Note on the Correlation of Averages," *Journal of Educational Psychology*, XIX (December, 1928), 636-642.

The study was prompted by a Miss Burke's statement in the *Twenty-Seventh Yearbook of the National Society for the Study of Education*, Part I: "Correlation coefficients become inflated when averages are employed because a great many factors that ordinarily keep the correlation between intelligence and education from being perfect cancel out." Miss Walker shows that, in general, correlations between averages is the same as correlations between original scores.

HUBBARD, RUTH M. "A Measurement of Mechanical Interests," *Journal of Genetic Psychology*, XXXV, (June, 1928), 229-254.

The article is a report of the interests of Junior High School boys. The author states the problem as follows: "Specifically, the aim was to construct an interest analysis, that should discover the interests accompanying mechanical ability, the reliability of these interests, their relation to measures of mechanical ability and to environmental opportunities of a mechanical sort, to measure differences in mechanical interests among boys of different ages."

An interest blank was constructed and tested for validity and reliability. It was then applied to a considerable group of Junior high-school boys in the Minneapolis Public Schools. The author gives the following summary:

1. Among junior high-school boys have been found differences in interests, significant enough to constitute the basis for the construction of an objective interest analysis.

2. A scoring scheme was built up by correlating shop ability, as indicated by an objective criterion, with attitudes to items as recorded on the blank.

3. In general, interests accompanying mechanical ability seem to indicate a preference for occupation with things and dislike for occupations where people enter as a large factor.

4. The odd-even Brown-Spearman corrected reliabilities of .87 for the criterion and .75 to .78 for comparable control groups indicate that the interest analysis is sufficiently consistent for use with groups.

5. The validity of the questionnaire was measured in several ways:

(a) By a correlation of .66 with the criterion of shop ability.

(b) By correlations varying from plus .09 to plus .46 with the mechanical tests when given to the criterion group.

(c) By correlations varying from —.11 to +.33 with the three tests when given to control groups.

(d) By correlations between interest scores and the battery made up of the three best tests combined, of .57 for the criterion group and from .00 to +.35 for control groups.

6. The correlations with 33 environmental variables indicate that no one of the factors measured has a very great effect on mechanical interest.

7. The relative relation between mechanical interests and mechanical abilities was about that found between other sorts of interests and abilities.

8. Interests contribute to the prediction of mechanical success as measured by shop ability; when combined with suitable mechanical tests.

9. No significant difference in mechanical interests were discovered between academic and vocational high-school boys.

10. Vocational high-school boys made poorer scores in mechanical ability tests than academic school boys of the same ages.

# NEWS and COMMUNICATIONS

Address all research news and communications to Editor Earl Hudelson, College of Education, University of Minnesota, Minneapolis, Minnesota.

Administrators, teachers, and school boards who are desirous of bringing school and its community into rapport will find in the *Pasadena, California, School Review* an excellent example of one means toward that end. The *Review*, the official publication of the Pasadena Board of Education, is now in the fourth number of Volume I. It will be of special value to communities containing junior colleges.

In his current report to the Trustees of Teachers College, Dean Russell elaborates upon the triple problem of modern education and points out several adaptations which institutions of higher education must make in order to meet those problems. "We are confronted," he says, "with the simultaneous impact upon the school of three popular demands—that pupils be accommodated in greater numbers, that training of better quality be offered, and that there be greater economy in all public expenditures." Our inherent faith "that the time may soon come when the race of life will be run from an even start with a free field" is the explanation of the growth of our school system and forms the underlying cause of the extraordinary expansion of all its parts.

At the same time the public wants better quality of education. It takes seriously the comparison of its schools with foreign schools and the criticisms of employers of the human products of our schools. Legislatures and school authorities, sensitive to these criticisms, are raising entrance and graduating requirements. "Certain colleges practically elect to membership a favored few. Waiting lists are long. Institutions secure popular support by announcing as their aim education of fine quality, and they point with pride to small classes, individual instruction, and education by conference under a tutorial system."

Yet the American people display a solicitude concerning all public expenditures. "Some experts assert that the United States cannot afford to support its present educational program. This seems absurd, but one may well pause when he looks into the future. If the American people proceed with a policy of extending education widely and at the same time increase expenditures in order to work for quality, the time may be not far distant when we shall be forced to consider whether we, as a nation, can afford to pay for all that we want. It is to be hoped that our economists will address themselves to this problem..... If it were possible to give satisfactory education to large numbers in big institutions under conditions of reasonable economy, the result would be of utmost importance. After all, it is a question of the possibility of quantity production of quality in education.

"The colleges are not remaining static. Despite the fact that some are strictly limiting attendance, there are many that are trying to improve their

methods the better to adjust themselves for numbers. There is no part of our educational system in which so many changes are being made and so many new ideas being introduced. The school and the college as we find them today are already making efforts toward quantity production in response to the demands that many be educated. They are modifying their procedures so that many may be educated better. By giving quality in quantity they are serving the interests of economy; but the persistent demands for extended facilities, the criticism of American standards, and the call for reduced expenditures indicate that the problem is not yet solved and that much remains to be done."

In its recent report on *Child Labor in Mississippi*, the National Child Labor Commission reveals three respects in which the situation is unsatisfactory. "Many children are engaged in occupations not covered by the child labor law, for whom there is no restriction either as to age or conditions of work. Many children are engaged in occupations covered by the child labor law at an age which is entirely prohibited. Many of the children who have reached the legal age for such employment are employed in violation of the provisions regarding hours and night work." The report reveals no evidence of any deliberate abuse of children. "It is the same old story: an unconsidering public accepts with but little question low legal standards, and with even less question lack of enforcement. Poor laws are nullified by common consent and there is no fully informed public to decree and enforce by the law of custom what the state and local authorities fail to decree and enforce. .....A compulsory education law, the enforcement thereof, and the establishment of an accurate up-to-date census, are the direct results of evolutionary processes. They grow and develop as the need for each is realized and appreciated. They are never much higher nor much lower than the public sentiment of the community demands; and in Mississippi there is evidence of an increasing appreciation of their importance."

A perusal of a recent circular from Ginling College, Nanking, China, makes one wonder whether the appellations "old world" and "new world" are not losing their distinction, at least educationally. Ginling is incorporated under the Regents of the University of the State of New York, thus having the right to grant the A. B. degree to her graduates, who are admitted to post-graduate privileges in American colleges. Among her faculty are graduates of Bryn Mawr, Chicago, Clark, Columbia, Drury, Illinois, Indiana, Michigan, Mount Holyoke, Oberlin, Smith, Wellesley, Western, Wisconsin, and Oxford, England. These instructors not only return home at times for further professional training, but keep abreast of educational progress through the best professional publications. The college was opened in September, 1915, with nine students. The statistics for the tenth year show one hundred thirty-three students from twelve provinces, forty-nine preparatory schools, eleven denominations, and all ranks of society. About seventy-five per cent of the student body plan to teach; sixteen percent hope to study medicine; and ten percent expect to do evangelistic or social work. Even after marriage they will be active along some line of social service. The total number of graduates, 1919-1924 inclusive, is fifty-three. Of these forty-four are teaching

or have taught; thirteen have studied in America and ten are still here; five have studied medicine; seven have married. Literary work, the Y. W. C. A., and social service are also represented in alumni activities. As with practically all collegiate work in China, all instruction in Ginling, except in the Chinese department, is given in English. More than eighty percent of the students are Christians, although more than one-third come from non-Christian homes. The influence of the college woman in China is proportionally greater because she is so much above the average level. Ginling draws her support from America, and to America looks for guidance.

The refinement of educational tools and the influence of a professional or vocational motive are demonstrated by the fact that all members of the Byrd Antarctic Expedition have been taught a system of rapid writing that will enable them to record their observations and experiences. They mastered the system in six weeks.

The new Graduate Library School at the University of Chicago was formally opened in October with the assembling of the first class for a course in "The Origin of the Printed Book." Created by the Carnegie Foundation by a one-million-dollar gift to the University, the School is unique in being the only purely graduate library school in the nation. Only students with a Bachelor's degree and who have had experience in library work are admitted for this advanced training toward a Master's degree or the doctorate. The chief method of the School will be individualized research in the problems of library science and theory. Professor George A. Works, formerly of Cornell University, is dean.

That a knowledge of his pupils' physical and temperamental, as well as their intellectual, differences is a fundamental responsibility of every teacher is the theme of a recent Bulletin of the Sam Houston State Teachers College of Huntsville, Texas. The bulletin, prepared by Professor T. S. Montgomery, reports a survey of mentality and achievement of pupils in the Goose Creek Public Schools. The survey covered mentality and achievement in all elementary branches and mentality and achievement in algebra in grades eight, nine, and eleven.

Approximately forty-eight percent of the forty thousand graduates of the Pennsylvania high schools for the school year 1927-1928 are continuing their education. The number of graduates of high schools in Pennsylvania has more than doubled during the past eight years.

Sabbatical leave on regular salary minus the cost of a substitute as recently adopted by the school board of Terre Haute, Indiana, may be granted for one year of study to any member of the teaching, administrative, supervisory, or library staff after seven or more consecutive years of successful experience in the public schools of the city.

Of 176 law schools in the United States and 10 in Canada embraced in the annual review of legal education for the year 1927-1928, by the Carnegie Foundation for the Advancement of Teaching, 14 full-time law schools in the United States and one full-time school in Canada require for graduation more than five academic years of work beyond high school.

Pupils in or near Chicago are supplementing their study of geography by listening to radio travel lectures as they watch appropriate lantern slides.

All who are concerned with the problem of educational support will be interested in learning that the national wealth of the United States about equals the combined wealth of Great Britain, France, Germany, Italy, Canada, India, China, and Argentina. The Immigration Study Commission estimates the present wealth of the United States to be nearly half that of the entire world. According to this Commission the correlation between national wealth and wages is highly positive, and those between wealth and population pressure and wages and population pressure are low.

Marked superiority of class work done by children taught with films over that of children taught by other classroom methods has been demonstrated by the formal completion of the most extensive experiment ever undertaken in education. A 33 percent gain in geography and a 15 percent gain in general science were scored by approximately 5500 children taught with specially prepared films over 5500 taught the same subject material without the aid of motion pictures, in a trial in public schools in twelve widely scattered cities, directed by Dr. Ben D. Wood of Columbia University and Dr. Frank N. Freeman of the University of Chicago. At the middle of October the two educators finished their 50,000 word report on the experiment, which was conducted over a period of ten weeks last Spring.

If properly planned classroom films can raise pupils' marks by an average of 24 percent as in this experiment, the report indicated that many failures will be turned into passing marks, since the great majority of failures are by less than 24 percent. Thus the time required for repeating courses will be saved in many children's education, and large cost will be saved to municipalities. The average expense of keeping a child in school for a year is $100, which in Chicago, for instance, where there are 30,000 failures a year, would mean a saving of $3,000,000 a year if failures could be completely eliminated.

The experiment, representing the first time a nation-wide investigation has been made into the controversial question of the value of films in classroom teaching, was sponsored by the Eastman Kodak Company, which, as the result of the preliminary findings of Dr. Wood and Dr. Freeman last Spring, established a $1,000,000 subsidiary corporation, Eastman Teaching Films, Incorporated, to prepare educational films for use from the primary grades up through graduate technical school work.

For the twenty-fifth year Hart Schaffner and Marx of Chicago offer prizes for the best studies in the economic field. Contestants are divided into Classes A and B. Class A includes any resident of the United States or Canada, without restriction. First prize in this class is one thousand dollars; second prize, five hundred dollars. Class B includes only those who at the time the papers are submitted, are undergraduates of any American college. First prize in this class is three hundred dollars; second prize, two hundred dollars. The present contest for Class A closes on June 1, 1929, and for Class B on July 1, 1929. Detailed information about the current contest, suggested topics for study, and a list of the prize-winning topics of past years can be obtained from J. Lawrence Laughlin, University of Chicago.

The merging of two of America's best known educational magazines took effect November first, when the *Educational Review*, recently acquired from Doubleday, Doran and Company by the

Science Press, was combined with *School and Society*. The magazine will be published weekly throughout the year, under the editorship of J. McKeen Cattell with the coöperation of William McAndrew.

The *Educational Review* was established in 1891 by Dr. Nicholas Murray Butler, now President of Columbia University, and was under his editorial direction for twenty-nine years. Dr. Frank P. Graves, formerly Dean of the School of Education at the University of Pennsylvania, and now New York State Commissioner of Education, acted as editor for four years, after which time William McAndrew, recently Superintendent of the Chicago Schools, became editor.

*School and Society* was established in 1915, and since its founding has been edited by Dr. Cattell. During its history it has absorbed the *School Journal*, established in 1874, and *The Teacher's Magazine*, established in 1878.

### The Value of Literature on Tests

The members of my class in Educational Tests and Measurements were each required to write a brief report of the value to them of certain suggested supplementary reading in connection with the course. The following report by a Chinese student not only gives an interesting viewpoint but also illustrates the language handicap of such a student when he attempts to assimilate a course in scientific education.

"I have paid enough attention to the current periodicals, not particularly with an eye on tests and measurements. I have enjoyed much the Yearbooks of the *National Society for Study of Education*, but much of the old stuff gives me little insight.

"I am convinced that tests and measurements are the most valuable and powerful tool and wonderful creation in the present school world. They have already admirably put out education for the claim as a science, and admirably replaced the old examination system as the true servant of the now perplexed or fortunate schoolmasters. They deserve all the good words said of them, and are responsible for little of the blames laid to them. They are worth the effort and support of the best minds and bravest souls, who only will make them work greater wonders and gather more laurels.

"Nevertheless, as with all blessed tools, they may turn a greater curse in proportion to their blessings, abused as fads, and the testers have to be more careful than usual, as in regard to reliability, validity, and probable error. I do not know what a drastic consequence they will involve if, for example, in the recent Yearbook's study of 'Nature and Nurture' validity and probable error are not given sufficient attention."

Walter Crosby Eells
*Stanford University*

### An Evaluation of Three Methods of Teaching Citizenship

The problem for this experiment was to appraise as accurately as possible three methods of teaching citizenship, namely, the socialized procedure, the traditional method, and the differentiated assignment with three groups of about forty 9B pupils each at the Peckham Junior High School of Milwaukee.

Individual record sheets were kept with three sections, namely, general information, information regarding past scholastic performance, and the scores obtained at the beginning and end of the period under observation. The following standardized tests were given: Illinois

Intelligence test, Brown-Woody Civics test, and the Hill Civics Attitude and Information test. The educational objectives and units of instruction were based on some of the important functions of community life and were the same for each group.

Procedures must be considered and evaluated as to their immediate and ultimate effectiveness. We realize that instruments of measurement are not yet refined adequately enough to take into account those intangible personality characteristics known as attitudes, sentiments, and associative habits. This is an outstanding handicap in determining the results of an experiment of this nature. There are so many ramifications to a single procedure that a few statements will have to suffice here.

*Socialized procedure.*—This was a socialized procedure within pupil control. Besides the necessary officers, constitution and by-laws, there were four standing committees, namely, a committee on historical and evolutionary phases of the unit, a committee on present day problems, and one on debates, playlets and other methods of self-expression and on bibliographies. The members rotated on these committees after the completion of a unit so that all had a chance to serve on each committee. The chairman of the committees and teacher were responsible for the organization and division of committee work. When a pupil reported on any of these committees, he handed in a written outline with a bibliography attached. Objective tests were given several times a week.

*Traditional method.*—This class was conducted in a more formal way. A more or less pervasive problem was stated at the beginning of the hour. This was followed up by a number of questions which led to the solution of the larger problem. The teacher tried to stress the establishment of primary bonds without any regard for socialization. Pupils kept outline notebooks in which salient points of the unit subdivisions were written. Tests were administered frequently.

*Differentiated assignment.*—This procedure was designed to provide for individual differences in pupils. A preview was given with the aid of the pupils and an objective test followed. Three-level assignments were made which were followed by assimilation and discussion periods. Tests were then given and drills on essentials were given as the occasion demanded. The students were not asked to complete a particular assignment but were encouraged to work as many as possible. The situation was a human one and flexibility the key word.

The following medians were found on the Illinois Intelligence test: Section II (socialized procedure) 104.3; section IV (traditional method) 101.6; and section VII (differentiated assignment) 95.0. A transmuted composite score of the three standardized tests which were administered at the beginning and the end of the period of instruction was found for each pupil. In figuring the transmuted composite score, the weight accorded to each test was based on its standard deviation. The differences in standard deviations, arithmetical means and medians were portrayed graphically. The differences between the arithmetical means of the transmuted composite scores at the beginning and at the end for the various sections were: socialized procedure, 7.65; traditional method, 5.1; differentiated assignment, 5.55. This would indicate that the class taught by the socialized procedure made the greatest progress. The reliability of the means of the beginning and follow-up

test scores for each section was computed and then the reliability of the difference between the means for each section using the formula

$$r_{diff} = \sqrt{r^2\,(_{sve}{}^1) + r^2\,(_{sve}{}^2)}$$

The actual difference divided by the r difference gave the following results: socialized procedure 4.018, traditional method 2.408, and the differentiated assignment 2.66 r. The chances that the true difference is greater than zero for the socialized procedure are 99.9+ in 100 chances, traditional method 99.2 in 100, and differentiated assignment 99.5 in 100. The reliability is high for each difference; particularly is this true for the difference in the means for the socialized procedure.

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## WHERE SHALL WE PLACE THE ASSUMED MEAN?

In a recent note, "On the Finding of the Arithmetic Mean and the Median from Grouped Data,"[1] Symonds has considered the question of the choice of values for the assumed mean and for the lower limit of a class when central tendencies are to be calculated from grouped data. After a careful summary of the arguments and a report on the practices of various authorities—an authority seemingly being a man who has written a book on statistics—comes to the conclusion that, to use a concrete example, a score of 20 should be considered as ranging from 19.5 to 20.5, rather than from 20.0 to 20.9999, and that the interval in which 20 occurs should be thought of as extending from 19.5 to 24.5, or 19.5 to 29.5 in the case of a ten point interval. As the note points out, either method is nothing more than a convention, and the question becomes one of expediency versus consistency. Since the 19.5-24.5 convention is consistent with the practice in physical sciences, Symonds argues that it should be adopted in educational work.

The present writer would agree that in general consistency is to be preferred to expediency, but he would argue that the final decision in any case should be made on the basis of the particular gains and losses involved. However, it is much more important to hold in mind that statistical methods used in educational work should be consistent with the data of education. Much difficulty has arisen because methods devised for handling the data of biology and economics have been taken over bodily into education without critical examination and evaluation.

The usual measurement in education deals with test results or school costs. In these fields the measurement cannot be taken "at its face value." A score of 20 on a test means that the individual made 20 points, and, in most cases, attempted more items on which his responses were partly right. Thus his score is always at least 20, and never falls below it. Similarly, a cost item of $20 is not an item falling between $19.50 and $20.50, but is actually $20.00. This argument, in so far as it relates to test scores, Symonds presents but believes it overweighted by his argument for consistency with physical science methods. The present writer believes that the weight of the argument lies the other way.

There is another fact which must also be taken into account before the direction in which the consistency argument operates can be decided upon. This is

[1] *Journal of Educational Research*, XVII (April, 1928), 298.

the fact that sooner or later in all our educational measurement we get around to considering most of our data on an age or grade basis. Now a child who is 72 months old is never 71.5; he is either 72.0 or 72.0 plus. This applies not only to chronological age but to all the other ages, subject, mental, and educational, which are so useful not only in themselves but also as a basis for the calculation of various quotients and ratios. Similarly, the pupil who is classified in grade 5 is not between grade 4.5 and grade 5.5, but between grades 5 and 6. Thus it would seem that the most important types of measurements in education—test scores, school costs, ages, and grade placements—all require for consistency with their own nature and consistency among themselves the method of classification which Symonds wishes to discard.

It may be pointed out also that the whole argument is futile in the light of the fact that only in the most unusual case would the mean or median of a distribution be significantly changed by the adoption of one method rather than the other. It is of no material importance whether the median IQ of a class is 99.8 or 99.3, or whether the mean score is 16.8 or 17.3 on a reading test. The writer cannot remember any central tendency among the many he has calculated which would have been materially different by the subtraction of five-tenths of a unit, which is the greatest possible amount of change.

Symonds admits that the physical sciences method is harder for the teacher of statistics to present, and more difficult for the student to understand. It is also inexpedient because of the greater difficulty and larger chance for errors in making the distributions.

Thus it appears that the physical sciences method is neither expedient, useful for increasing the accuracy of the obtained results, nor consistent with the nature of the data available in most educational measurements. It would therefore seem more wise for educational statisticians to use the 20-24.9999 interpretation, with 22.5 as the assumed mean.

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